

AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

JANUARY 15, 1957

In This Issue

- Large Germanium Rectifiers in New Plating Facility
- Press and Welding Setups at Briggs Plant in England
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- Merry-Go-Round Assembly for Making Truck Bodies
- Details of Marvel-Schebler Fuel Injection System
- Previews and Reviews of the Automotive Industries

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A CHILTON PUBLICATION

Heald RED HEAD'S extra precision and low maintenance

NOW AVAILABLE TO ALL USERS

of boring and internal grinding equipment

HEALD Red Head Boringheads and Wheelheads have achieved an enviable reputation for extreme precision and exceptionally low maintenance, on Heald Bore-Matics and Internal Grinders in use throughout the entire metalworking industry. Heretofore, they have been available only as original equipment or replacement items for specific Heald machines.

Now, however, in response to a continual and ever-increasing demand — and in line with the Heald policy of building standard machines and parts — it

has been decided to market all standard Red Head Boringheads and Wheelheads without restriction wherever practical. This means that the extra precision and low maintenance provided by Heald Red Heads are now available to all users or manufacturers of metalworking equipment, regardless, in most cases, of the type of machines on which they will be used.

The standard head types and sizes that can be supplied are fully described and listed in the Bulletins noted below.



HEALD PERMANENTLY- LUBRICATED BORINGHEADS

Designed to provide high, sustained precision with virtually no maintenance, Heald Red Head Boringheads are permanently lubricated — no grease or oil is ever needed. They run cooler, reduce heat distortion and maintain high accuracy at all speeds and loads. Spindles run in precision bearings, specially manufactured to Heald specification and individually tested and selected for each head. Write for Bulletin 5-1, Issue 6.

HEALD HI-FREQUENCY WHEELHEADS

Providing proper speed for small-bore grinding, Heald Hi-Frequency Wheelheads deliver full power direct to wheel and eliminate drive upkeep costs. They can withstand momentary peaks of twice the continuous-duty rating. Those running over 30,000 rpm must be automatically lubricated by the Heald Oil-Mist system which also supplements effects of water cooling — others are permanently grease lubricated. Write for Bulletin 6-2, Issue 2.

HEALD PERMANENTLY- LUBRICATED WHEELHEADS

Heald Red Head Wheelheads incorporate the same high quality bearings and permanent, sealed-in lubrication as Heald Red Head Boringheads. They have repeatedly set the highest standards of accuracy, precision and surface finish. There are three general types: Quill Style, for a variety of work — Naked Style for high production on a single workpiece — Sieve Style for large bores. Write for Bulletin 6-1, Issue 7.

IT PAYS TO COME TO HEALD

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

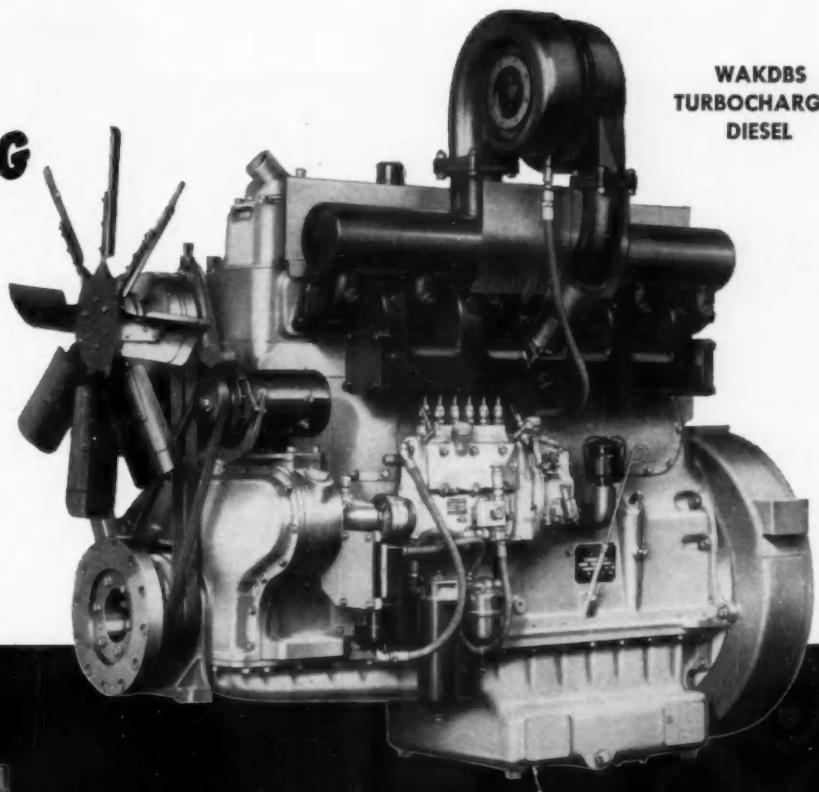
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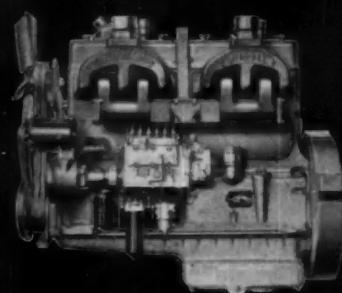
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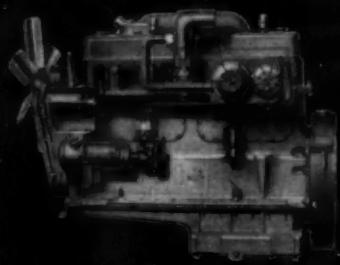
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Write for descriptive bulletins

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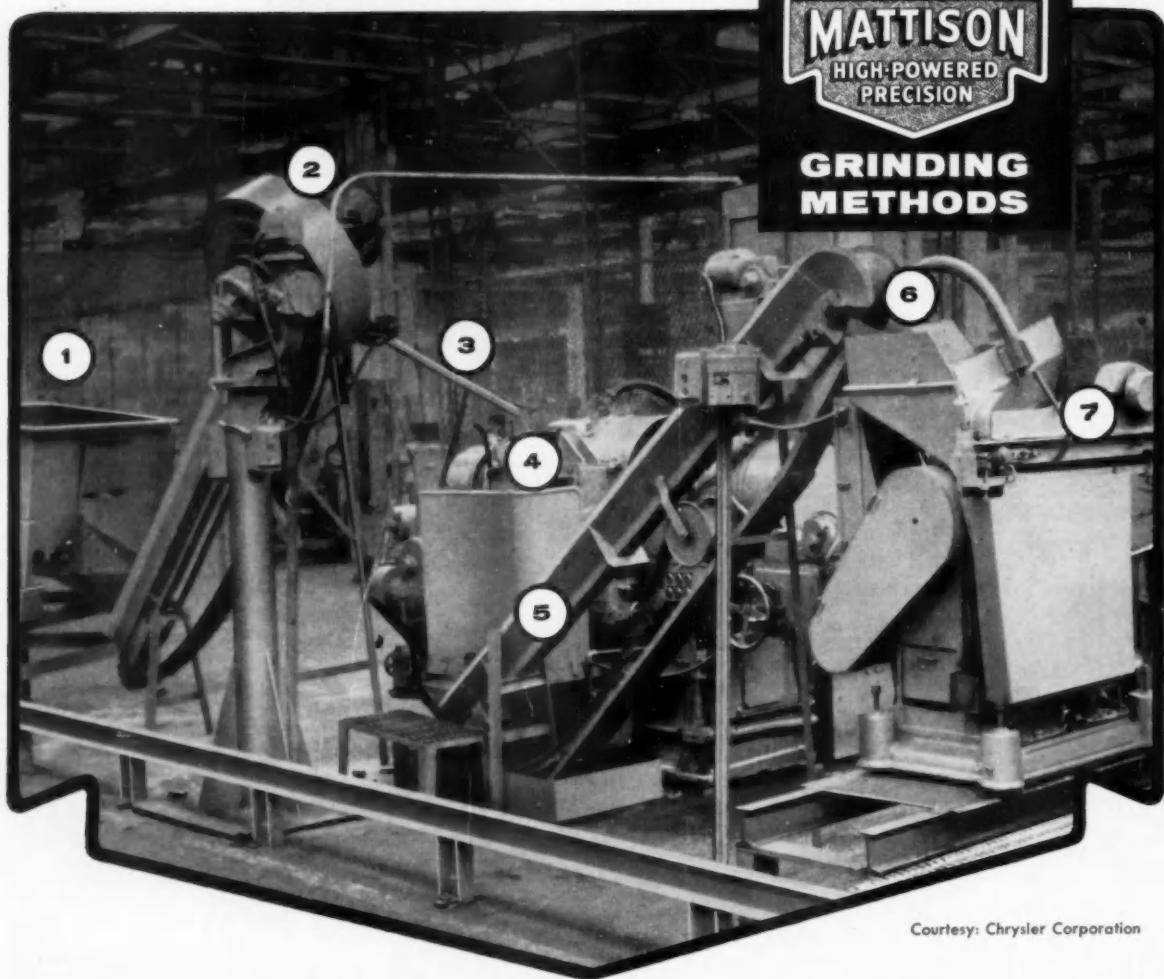
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WAUKESHA MOTOR COMPANY

Waukesha, Wisconsin

New York Tulsa Los Angeles

CASE HISTORY NO. 16—PISTON PINS



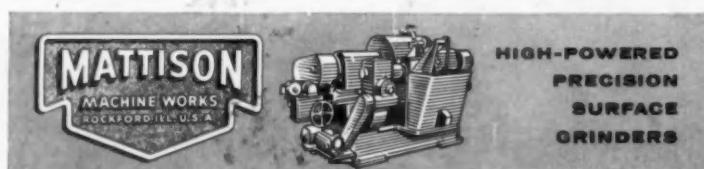
Courtesy: Chrysler Corporation

**Standard machine meets automatic requirements...
grinds two sides of pins in excess of 1300 per hour!**

Chrysler Corporation's New Castle, Ind. plant uses a Mattison No. 221 Double Disc Grinder to machine both ends of piston pins for six and eight cylinder engines for Chrysler-made cars and trucks at a production rate of more than 1300 per hour with a 20 micro inch finish. The machine produces at a rate that keeps it ahead of the production line. Automatic loading and sizing make it possible to run the machine with minimum attention by the operator. Tolerances are always well within specifications.

Operation of the grinder can be traced according to the numbers on the photo: 1) loading hopper for pins; 2) stacking drum; 3) channel carrying pins into grinder; 4) grinding station; 5) belt conveyor to next station; 6) loading hopper for next operation; 7) conveyor to centerless grinders for finishing o. d.

Stock removal remains constant because of the automatic equalization feature of the machine. These versatile double disc grinders may be the answer to your machining problem, too!



**HIGH-POWERED
PRECISION
SURFACE
GRINDERS**



This double disc grinder produces more piston pins than the engine line can use with minimum supervision.

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE

PUBLISHED SEMI-MONTHLY

JANUARY 15, 1957

VOL. 116, NO. 2

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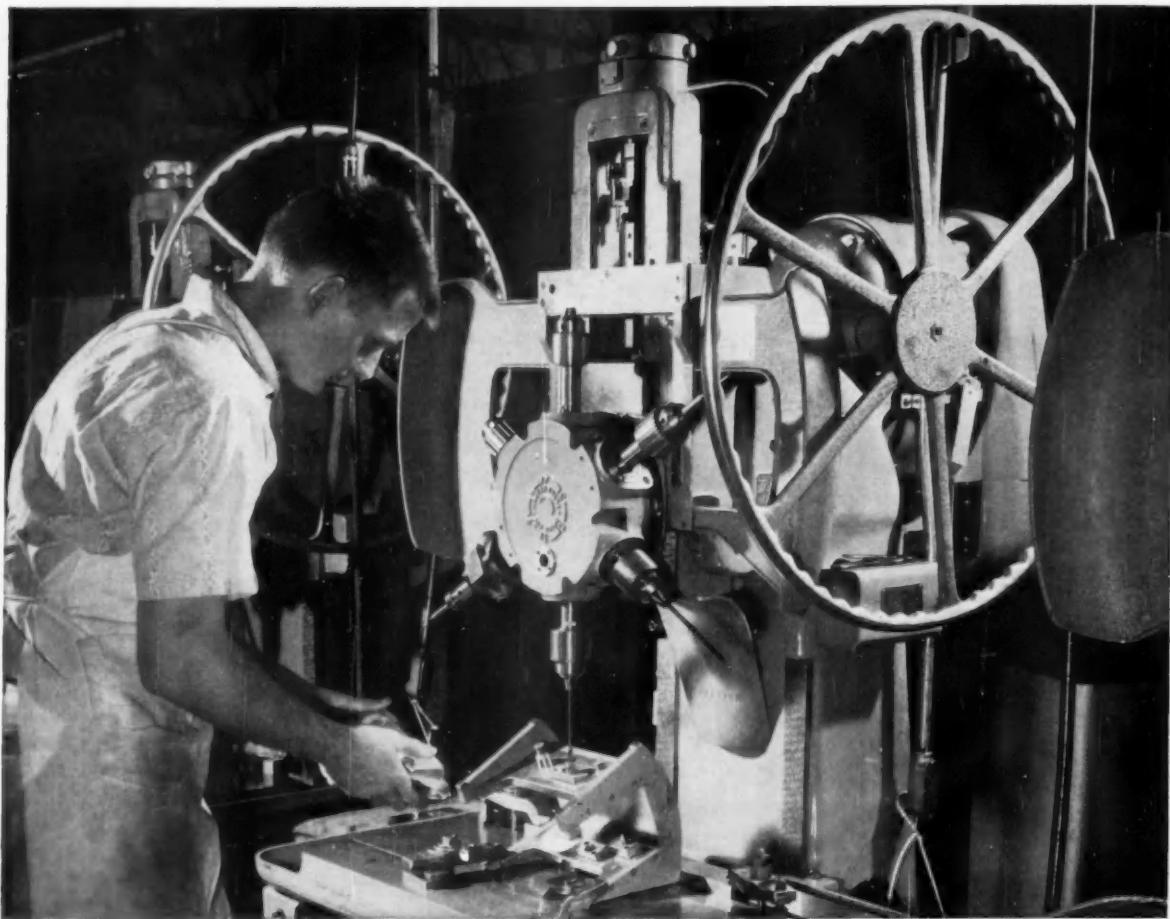


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HYATT Hy-Roll Tapers . . .**



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taper roller bearings



think of HYATT

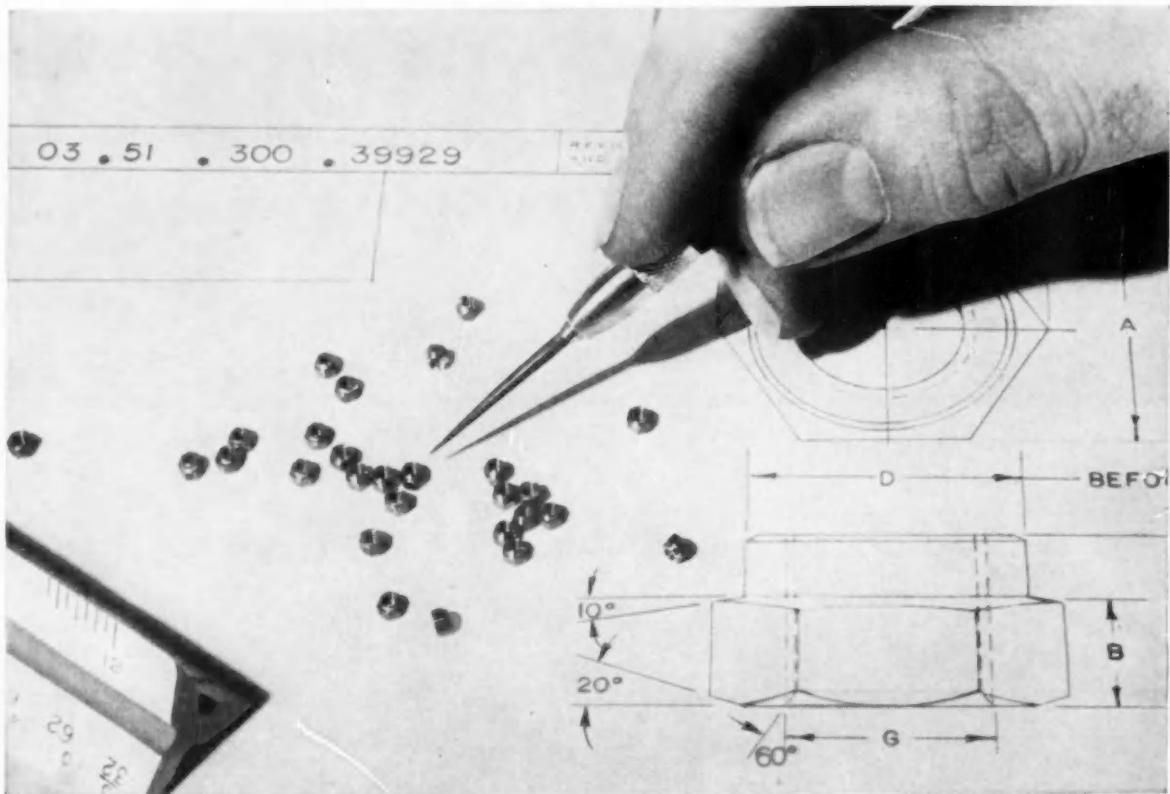


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1-64 NC-3B	.127	.123	.0635	.0585	.141	.090
1-72 NF-3B	.127	.123	.0635	.0585	.141	.090
2-56 NC-3B	.158	.153	.068	.063	.176	.105
2-64 NF-3B	.158	.153	.068	.063	.176	.105
3-48 NC-3B	.190	.183	.071	.066	.210	.120
3-56 NF-3B	.190	.183	.071	.066	.210	.120
4-40 NC-3B	.190	.183	.072	.067	.210	.120
4-48 NF-3B	.190	.183	.072	.067	.210	.120

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For complete information on Microsize FLEXLOCS, consult your authorized SPS distributor. Or write STANDARD PRESSED STEEL CO., Jenkintown 53, Pa.

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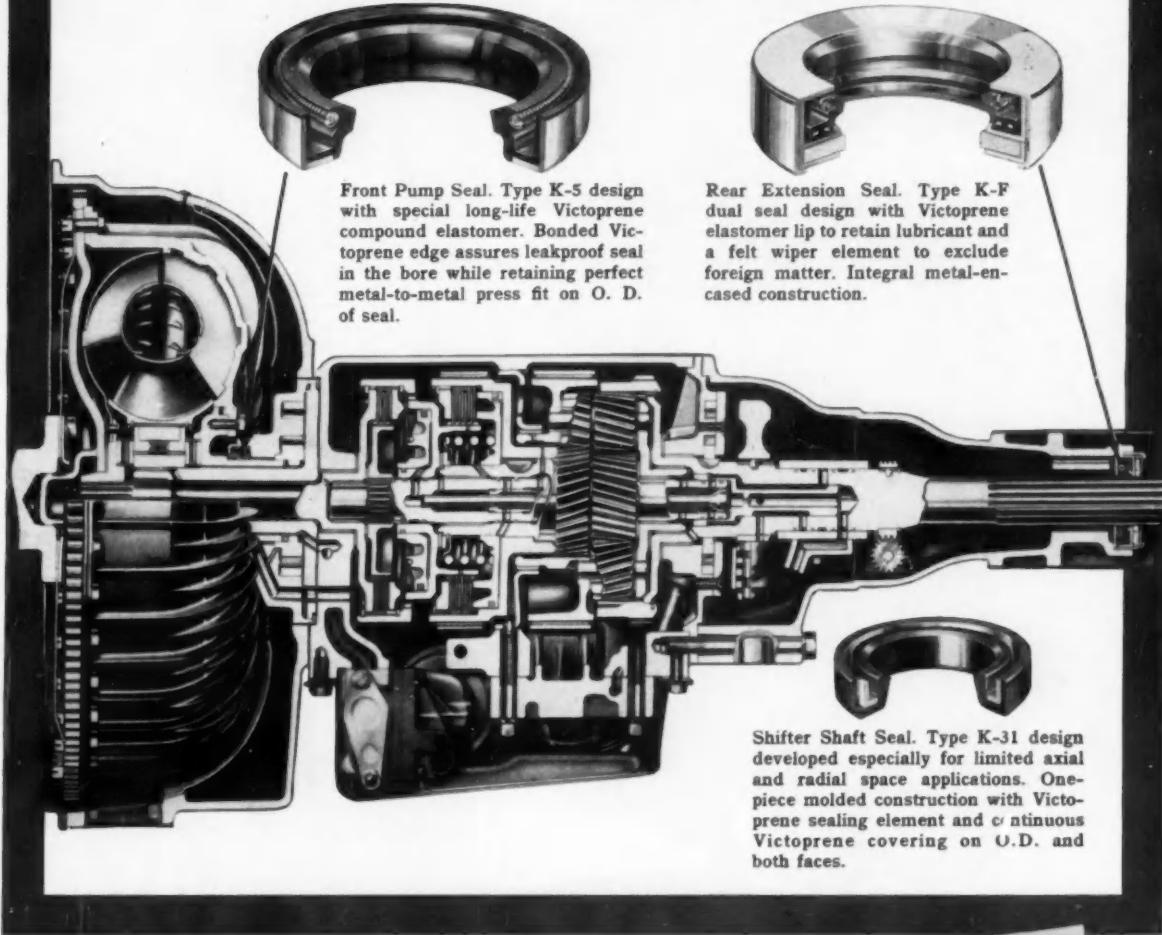
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17

....for better FORGING PRODUCTION !

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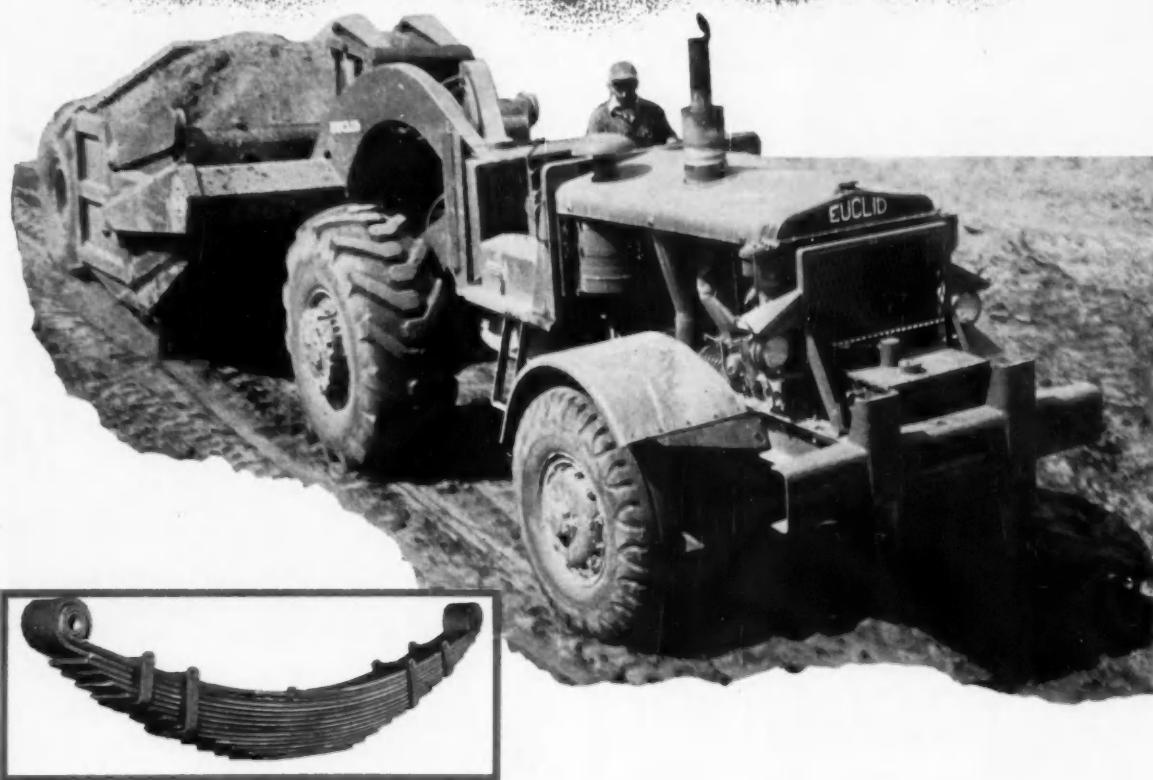
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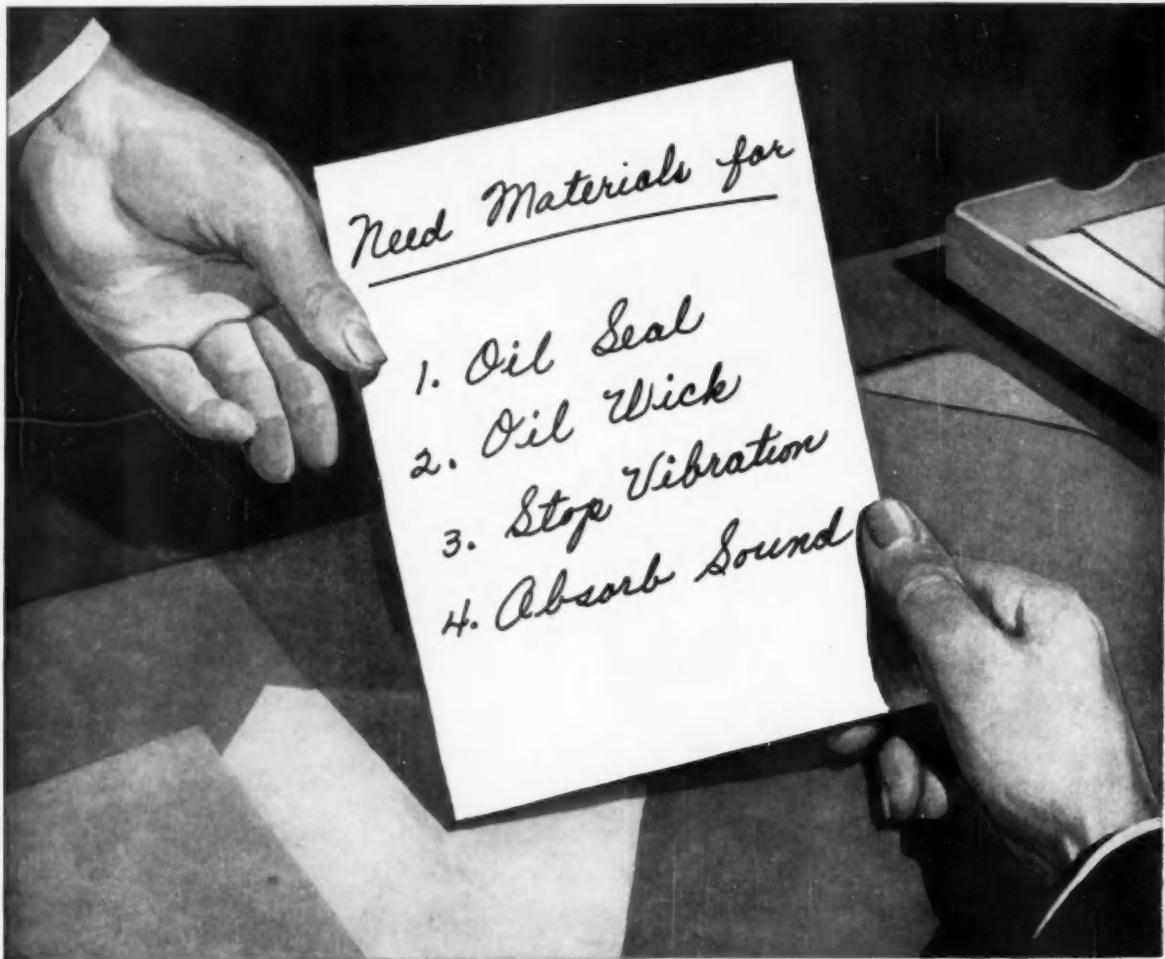
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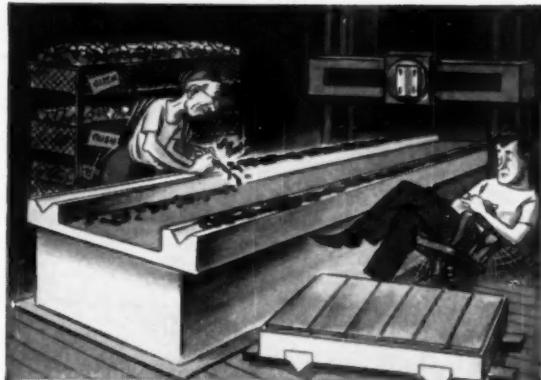


1. Cures "stick-slip" or "jumpy table". When a table gets the "shakes", especially after it has just reversed or when the load is heavy and the speed slow, it's probably suffering from "stick-slip". Remedy—Sunoco Way Lubricant®. Special polar compounds in Sunoco Way Lubricant form a friction-reducing film that keeps a table sliding smoothly under all operating conditions.



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AUTOMOTIVE INDUSTRIES, January 15, 1957



A Multipress case study



6-ton Denison hydraulic Multipress is used here to press valve lever over shaft; then stake lever securely to shaft.

MULTIPRESS® speeds transmission parts assembly at Chrysler

PRECISION assembly operations for automatic torque converter transmission components are performed quickly and economically by small Denison hydraulic presses at the Indianapolis plant of Chrysler Corporation.

While costs have been reduced, the high quality standards essential in a precision product have been maintained. Maximum operator safety is a Multipress bonus.

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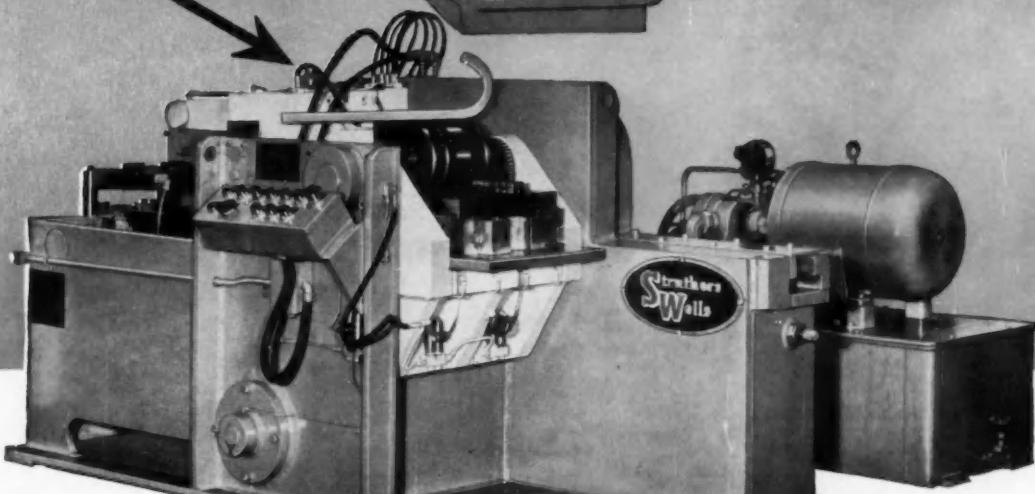
SEAT POSTS



ONE OF THE MANY

STRUTHERS WELLS TANGENT BENDER

PRODUCTS NOW
IN USE BY THE
AUTOMOTIVE INDUSTRY



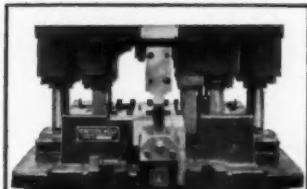
1

Part as received by customer. Note
roll-formed box section:



2

One end flattened, in die set-up shown.



3

The formed seat post. Tangent Bender
has upset metal free of wrinkles through
180° radius bend.

Struthers
Wells

TANGENT BENDERS

Smooth, fast, one-operation bending of many parts in use by the automotive industry is now provided at high production rates by the Struthers Wells Tangent Bender. Automatic load and unload is afforded, and complete SW automated sequences developed, including sheet destacking, punching and notching, roll forming, bending, and welding. Let us consult on your requirements.

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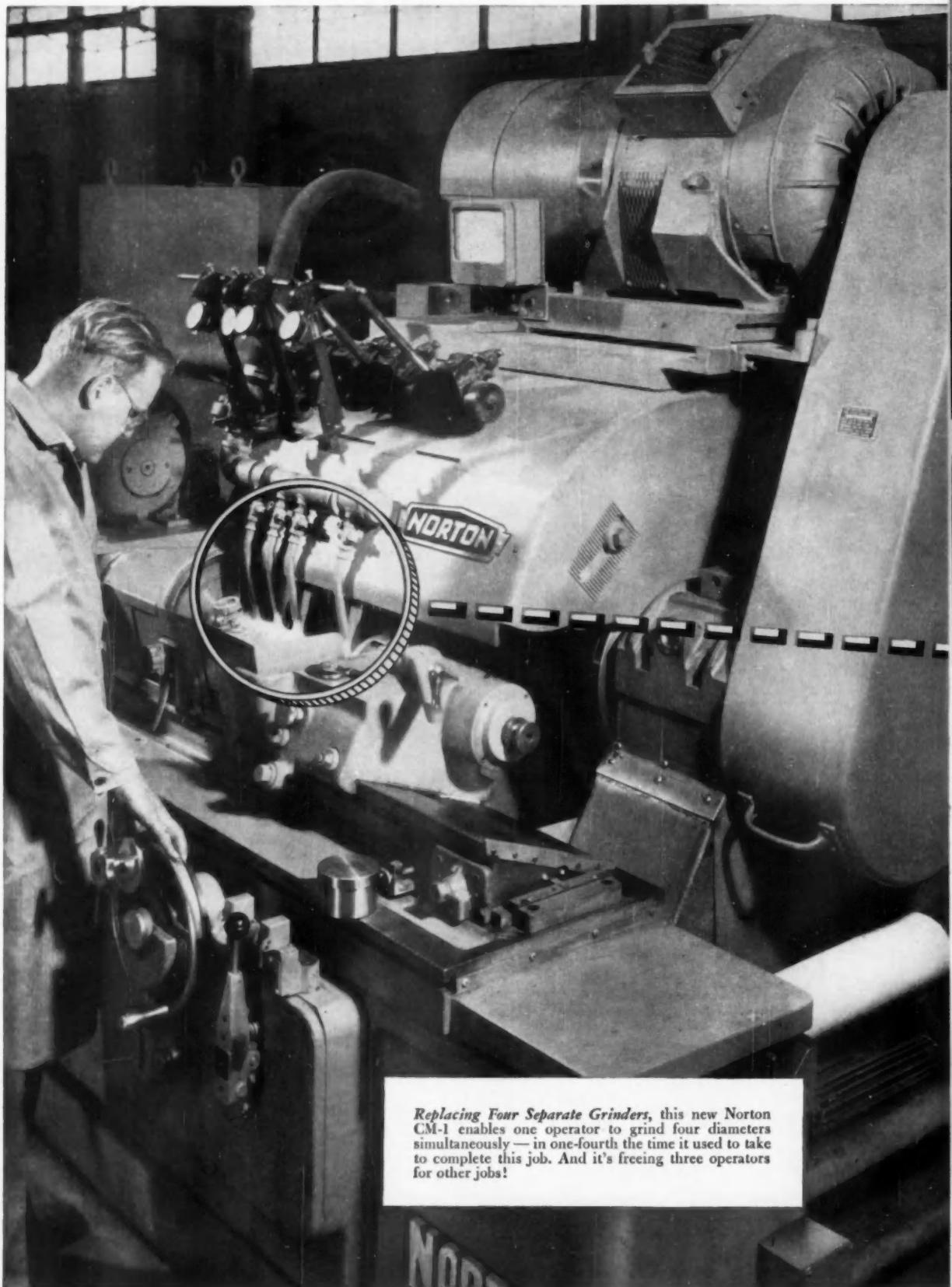
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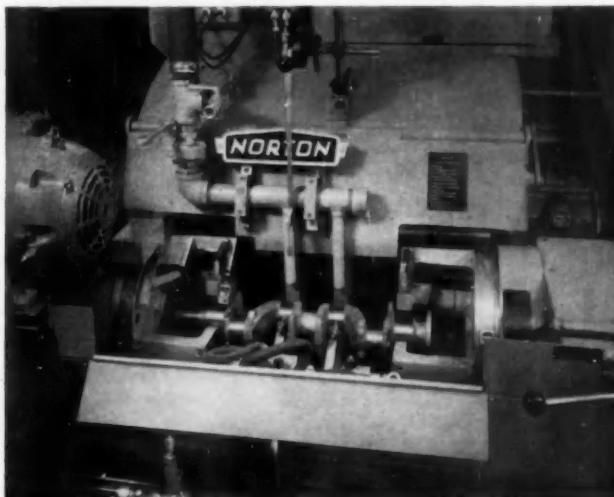
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Machines . . . Roller Table and Tumble Die
Bending Machines . . . Press Brake . . . Punch-
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Replacing Four Separate Grinders, this new Norton CM-1 enables one operator to grind four diameters simultaneously—in one-fourth the time it used to take to complete this job. And it's freeing three operators for other jobs!



A Great New Production Tool. The Norton Type CM-1 Heavy Duty Semi-automatic Multi-Wheel Grinder brings new efficiency and economy to the grinding of parts having multi-diameters—such as crank and cam-shafts, transmission and motor shafts, etc. Machine shown arranged for grinding two pins on automotive shaft. Machine is available also with power assist loading mechanism for certain jobs.

Here's a new Norton Grinder to boost your production rate

*Type CM-1 Heavy Duty Multi-Wheel Grinder
does four or more jobs at once, reduces capital
investment, cuts operating time and costs*

When you can get one machine that does the work of several, in a fraction of the working time, you save considerably on purchase costs, on operating costs, and on floor space.

That machine is now ready to go to work for you. The new Norton CM-1 makes four or more cuts in a single plunge-grind cycle, operating automatically under one-lever control. And it completes each separate grinding operation with the accurate, trouble-free performance that's built into every Norton grinding machine.

Typical Advanced Features

- Cartridge type bearings at each end of heavy, 10"-diameter wheel spindle assure extreme rigidity of spindle, longer wheel life, greater accuracy and control with minimum truing.

- Automatic truing device—in rear, out of operator's way—trues straight or formed wheels each individually, yet all at once, thus requiring only the amount of time needed to true widest wheel.

- Automatic compensation for collective wheel wear, including amount trued off. No adjustment or resetting of wheel needed after truing.

- Optional equipment includes built in automatic sludge remover and coolant filter, constant peripheral wheel speed control, increased power for wheel or work drive, etc.

Why not get the complete story of how the CM-1 can benefit your grinding operations? See your Norton Representative, or write us direct. And remember: only Norton offers you such long experience in both grinding wheels and

machines to bring you the "Touch of Gold"—to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5.

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NORTON
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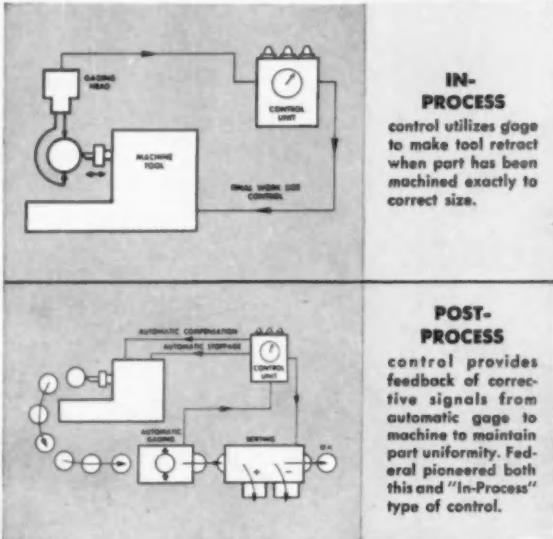
*Making better products...
to make other products better*

District Sales Offices: Hartford • New York
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Why FEDERAL offers more

RELIABILITY THRU DIVERSIFIED EXPERIENCE

Diversity in Automatic Control

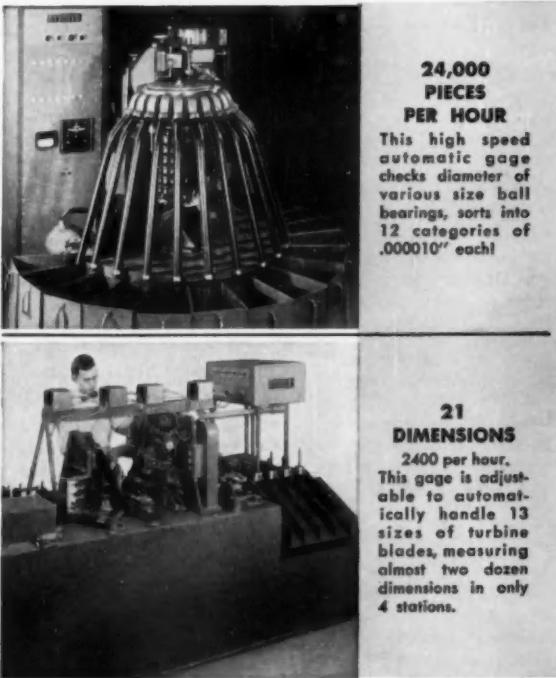


Diversity in Automatic Inspection



Any type of precision gage should be reliable, but when the gage becomes part of the automated process, reliability becomes of premium importance. There's a lot at stake. Over the years Federal has developed numerous ways to greatly increase Automation Gaging reliability. For instance . . . using extremely low voltage at sensitive switching contacts. This eliminates pitting, and tremendously prolongs contact life, maintains precision. And, Federal Automatic Gages employ electronic switching . . . vastly more accurate, faster, and more maintenance-free than the use of mechanical means to actuate work-handling relays.

You don't come by these features overnight. They are the result of hard-headed experience acquired in the designing and building of many diversified types of automatic gages. This extra reliability is bound to pay off. It's reliability which you not only can afford, but which *you cannot afford to do without*. And, only Federal provides it!



in Automation Gaging!

SIMPLICITY

THRU STANDARDIZATION



UNITIZED CONSTRUCTION

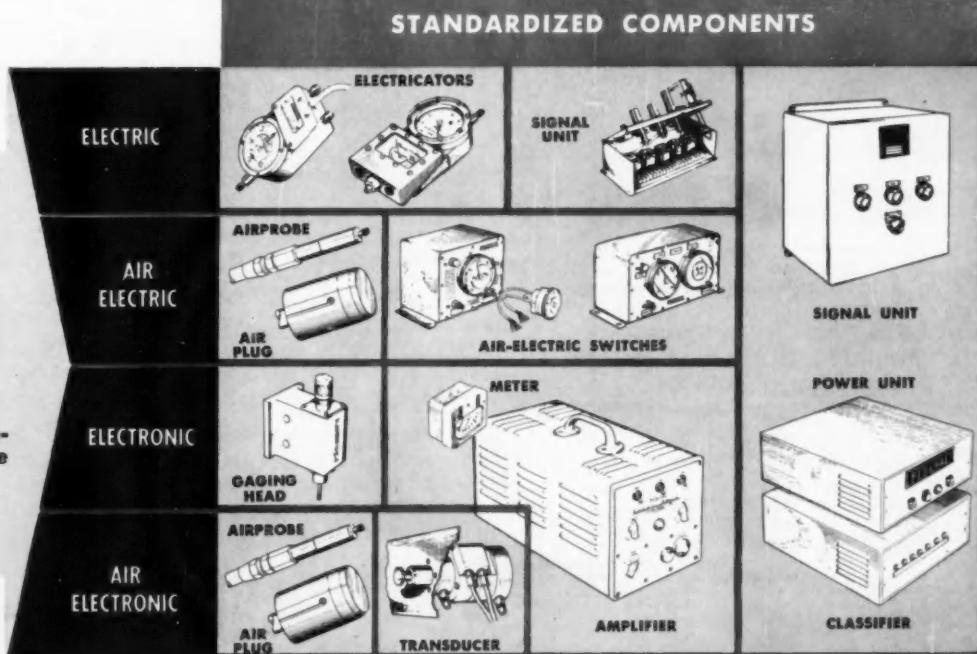
Critical elements are specially constructed for quick replaceability.

Automation will never become wholly standardized, but Federal — because it has had such long-time experience in this field — is able to meet most control and inspection demands using basic, standardized components. This means lower costs for you, for one thing . . . but much more importantly . . . it means greater reliability of performance. It means this too — much less dependence on technical talent and immediate service. Standardized units can be replaced with spares quickly and easily, should the need arise. What sizable savings in downtime costs!

This is the kind of common sense design you should have in return for your Automation Gaging investment . . . and Federal can give it to you. Ask your nearest Federal representative to come in and discuss this in terms of your own needs.

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7261 EDDY STREET • PROVIDENCE 1, R. I.

STANDARDIZED COMPONENTS



4 SYSTEMS OF GAGING

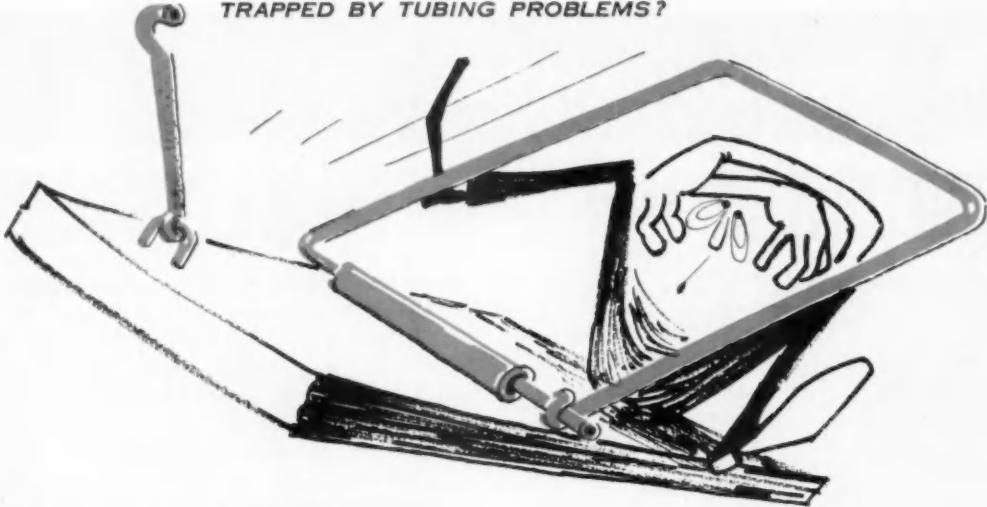
Only Federal provides this flexibility to meet gaging requirements more economically.

Ask **FEDERAL** *First*

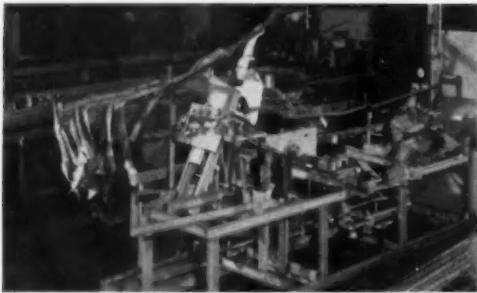
FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging

TRAPPED BY TUBING PROBLEMS?



LINES FORMED RIGHT... WITH GM STEEL TUBING AND UNEQUaled FABRICATION FACILITIES!



Rochester Products' many hydraulic forming fixtures turn out a fast, uniform flow of GM Steel Tubing fuel lines.

Fuel lines . . . oil lines . . . brake lines come *right* from Rochester! The industry's finest equipment forms, fits and fabricates these and other intricate assemblies for America's finest cars.

Rugged, reliable GM Steel Tubing performs its way into more new products every day. Tubing quality, engineering capability and production facility form a cost-cutting, schedule-saving line-up that's ready to go to work for you! Call your Rochester Products Sales Engineer or write us direct.



GM STEEL TUBING BY **ROCHESTER**
PRODUCTS

ROCHESTER
PRODUCTS
DIVISION OF
GENERAL MOTORS
ROCHESTER N.Y.



ACTION PICTURE of how to save money by riveting!

This action photo, taken on the frame assembly line in one of the largest auto factories, illustrates how cost-conscious manufacturers save money with Hannifin "Hy-Power" Hydraulic Riveters.

First step in assembly is to rivet the frame together...with Hannifin "Hy-Power" Riveters. The light-weight forged C-Frames hang from balancers within easy reach of each operator. No special skill is required to head the $\frac{3}{8}$ " rivets, cold, each in seconds. What's more, this "silent squeeze" method forms stronger, more uniform rivets, hot or cold.

Power source is the Hannifin "Hy-Power" Hydraulic Pressure Generator which quietly supplies pressure to the "Hy-Power" Cylinder that does the work. These riveters are available in 7 $\frac{1}{2}$, 10, 12 $\frac{1}{2}$, 17 $\frac{1}{2}$, 25, 35, 50, 75 and 100-ton capacities.

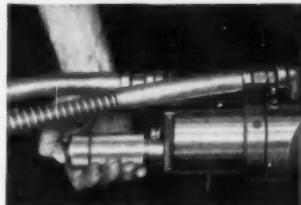
do All you can do...with

HANNIFIN

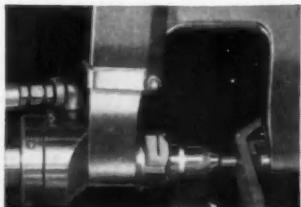
Hannifin Corporation, 543 S. Wolf Rd., Des Plaines, Ill.

Air and Hydraulic Cylinders • Hydraulic Presses • Pneumatic Presses • "Hy-Power" Hydraulics • Air Control Valves

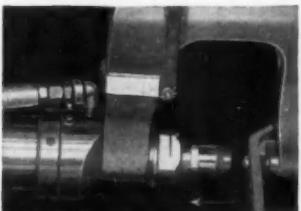
here's the
HANNIFIN
"HY-POWER"
WORK CYCLE



In position. A single control button starts (or interrupts) the automatic Hy-Power cycle.



Ram approaches fast, then hydraulic pressure automatically intensifies, and the rivet head is formed.



Fast, automatic return. Total elapsed time to head a rivet is only 2 to 3 seconds.

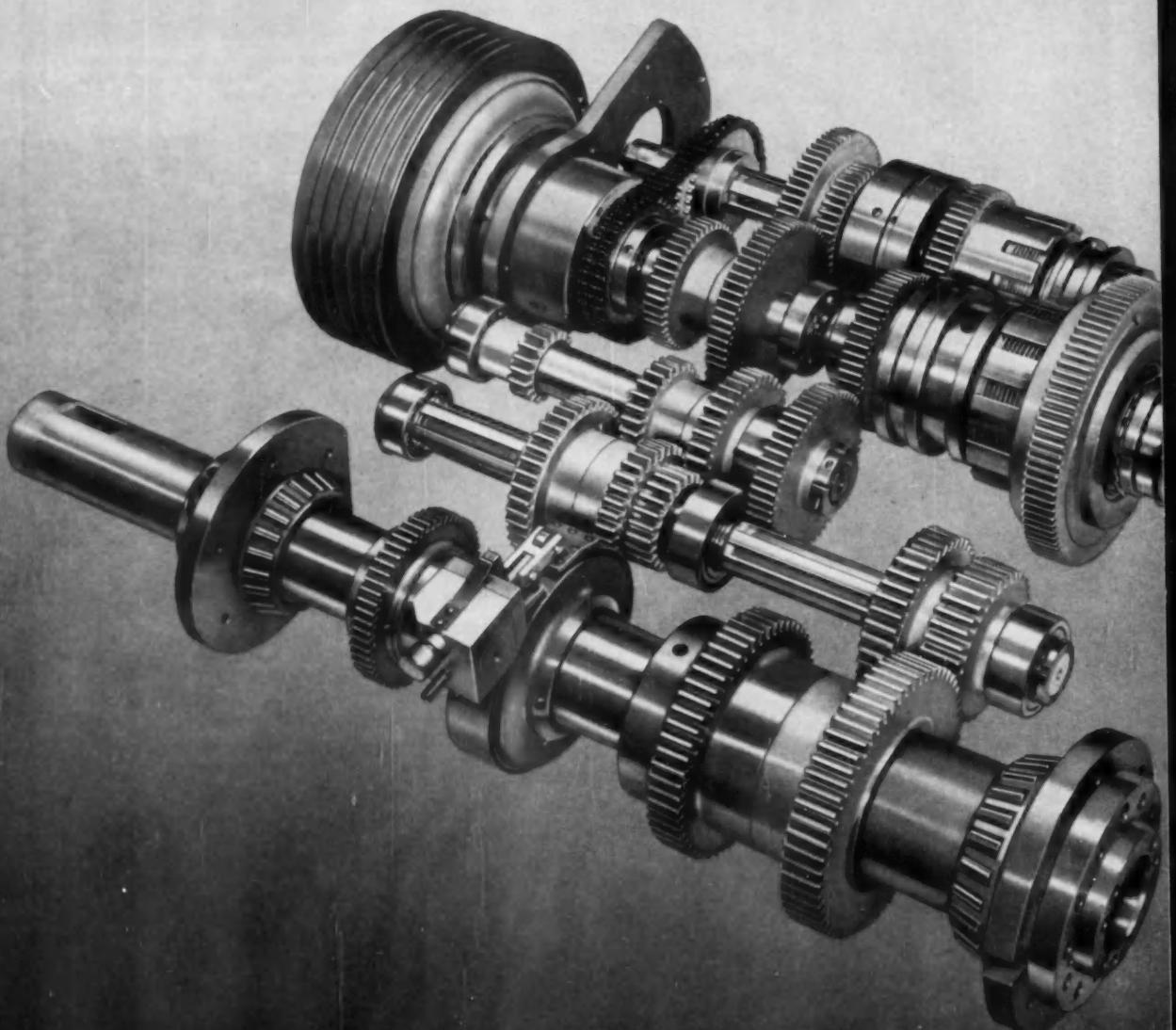
"HY-POWER" CAN ALSO BE USED IN MULTIPLE TO SET SEVERAL RIVETS

Bulletin 150 tells how to save money on riveting, staking, punching, forming and bending operations. Write for copy.



The power reserve and range of speeds

YOU'LL NEED FOR THE



TOOLS OF TOMORROW

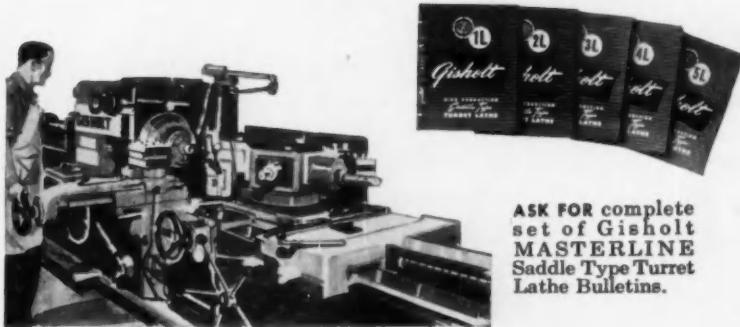
New *GISHOLT MASTERLINE* SADDLE TYPE TURRET LATHE

WANT MAXIMUM OUTPUT AND ACCURACY from today's carbide tools—with an ample reserve of power and speeds to meet tomorrow's tooling requirements?

That's what you'll get—*now*—from this powerful, rugged Gisholt MASTERLINE Saddle Type Turret Lathe. Prime example of this machine's advanced features is the rugged Headstock Gear Train, shown at the left. Here, you can get 24 different forward speeds—all from a *single*-speed motor. This means you get *full power all the time*—a critically important feature for those heavy cuts at punishing feeds.

But that's not all. To give you maximum performance from this powerful gear train, Gisholt designers have backed it with faster speed changes through the Hydraulic Speed Selector (effortless speed shifts without waiting or computing); a hydraulically operated Hi-Lo speed change in a 6:1 ratio (without stopping the spindle or shifting gears); and a new Self-Adjusting Electric Clutch and Brake (smooth, fast starting and stopping, plus more accurate inching of the spindle).

Ask your Gisholt Representative to give you the complete facts. Why not call him today?



ASK FOR complete
set of Gisholt
MASTERLINE
Saddle Type Turret
Lathe Bulletins.

GISHOLT
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Madison 10, Wisconsin, U.S.A.

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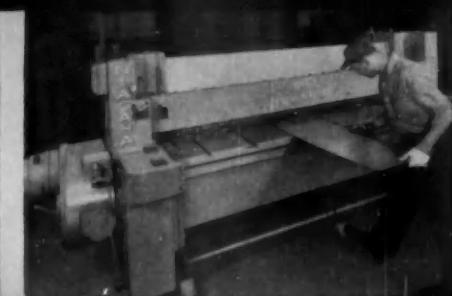


SHEAR USERS EVERYWHERE TELL THEIR STORIES OF NIAGARA BENEFITS

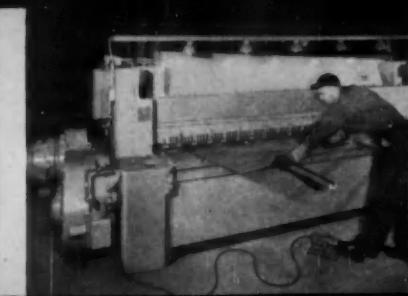
(3 of 19 Photo-Reports shown in Niagara's new Bulletin 69G)



"an exceptional machine value"
—World's Largest Trailer Mfr.



"For over 10 years . . . we have never had
any downtime for repairs and maintenance."
—V-Belt Pulley and Caster Mfr.



"High quality of accuracy with the
utmost in speed and performance"
—Midwest Road Machinery Mfr.



squaring shears can do for you!

Speed that spells peak productivity! Accuracy for cutting within micrometer tolerances! Ruggedness to stand the gaff on stiffest assignments! They're all yours with a Niagara Power Squaring Shear. New, fact-filled 74-page Bulletin is profusely illustrated to show you how and why:

From mass producers, fabricating plants, steel warehouses and sheet metal shops comes written evidence of the superiority of Niagara Underdrive Squaring Shears on jobs of every description. *No other shear can match Niagara's record for cutting accuracy, speed and downright economy of operation.*

For a photo story of the many tangible ways in which a Niagara Power Squaring Shear can boost hourly output, improve quality and slice maintenance costs in your plant, make sure that you

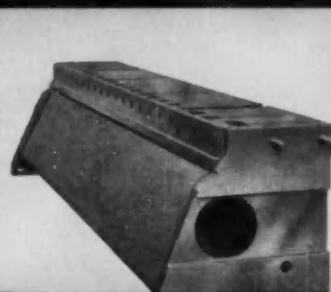
receive Niagara's newly-published Bulletin 69G by mailing the coupon below. Presenting the greatest shear story ever told this 74-page document will give you a close look at Niagara Shears in numerous applications . . . the closest look you have ever had at *any* shear, next to having it on your own floor! It will show you feature-by-feature why a Niagara Shear is far ahead at every point of comparison . . . and why it pays to look to America's oldest leading shear manufacturer for the most profitable answers to your requirements.

NIAGARA-DEVELOPED FEATURES PROVIDE THE ULTIMATE IN MODERN SHEAR PERFORMANCE

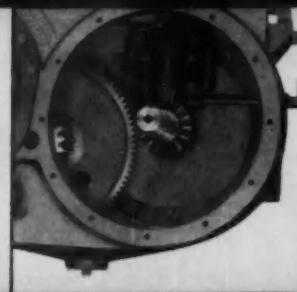
(Here's a glimpse at just a few of many. See them ALL in new Niagara Bulletin 69G)



Fully Closed Box Type Construction



Massive Bed Designed for Super Strength



Instantly Engaging Multi-Jaw Clutch



Powerful, Self-Compensating Holdown

YOURS FOR THE ASKING...

**the most comprehensive
shear bulletin ever published!**

Months in preparation, this fact-filled bulletin now gives you valid, inside facts on the nation's top line of power squaring shears. 74 pages! 141 revealing photographs and illustrations! Specifications for nearly five dozen standard models! Capacities: 16-gage to 1" mild steel. Cutting lengths: 4 to 20 ft. Make sure that you receive a copy at once. Mail the attached coupon today.



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MAIL your new Underdrive Squaring Shear Bulletin 69G to us immediately.

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Get this free sample kit of precision castings

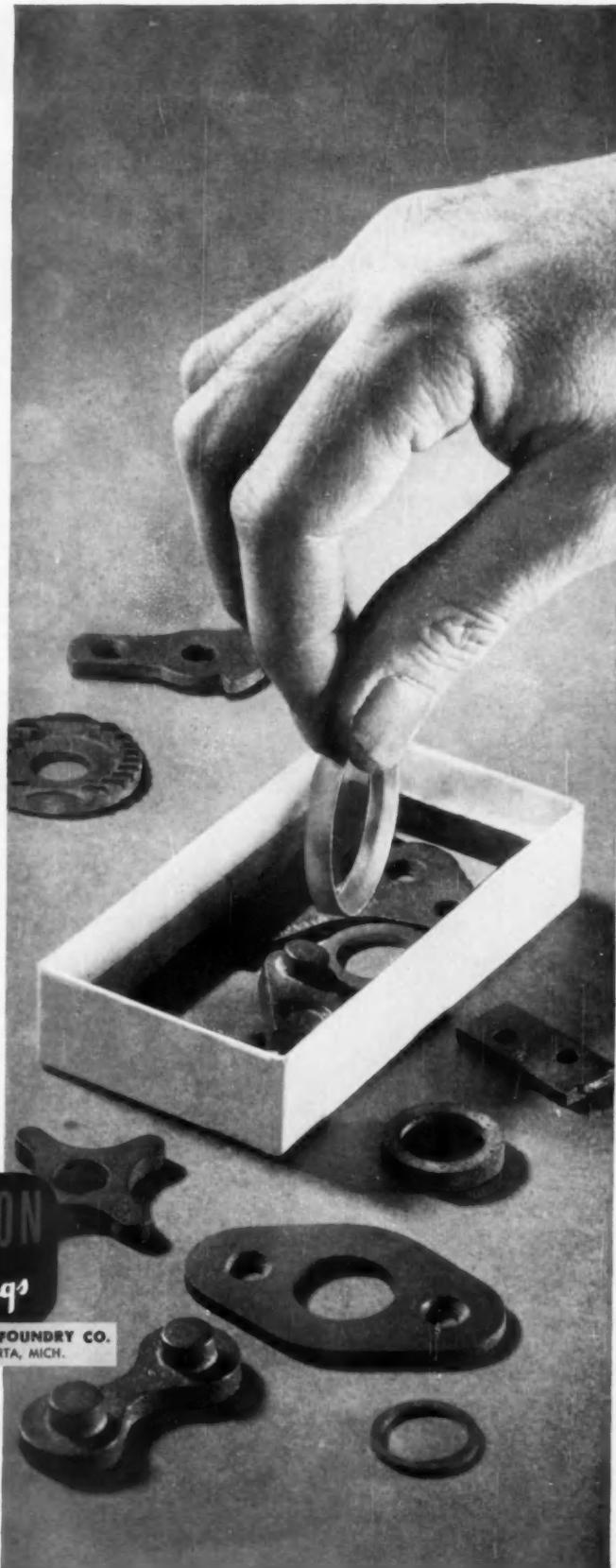
Here are the kind of precision castings Muskegon's Sparta Foundry can produce at surprisingly low cost. These small parts are actual samples of the workmanship and materials available from the world's largest piston ring casting foundry. Close examination will show that some of these castings are completely finished—surface ground, deburred, drilled, reamed and tapped—ready for immediate installation. Others are partially finished—with cast-in holes, recesses and projections. These parts typify how Sparta can reduce or completely eliminate your finishing and machining operation—with width tolerances held to within plus or minus .001"; flatness and surface finishes to your specifications. Write Sparta for your kit of miniature sample castings now!

Since 1921... The engine builders' source!



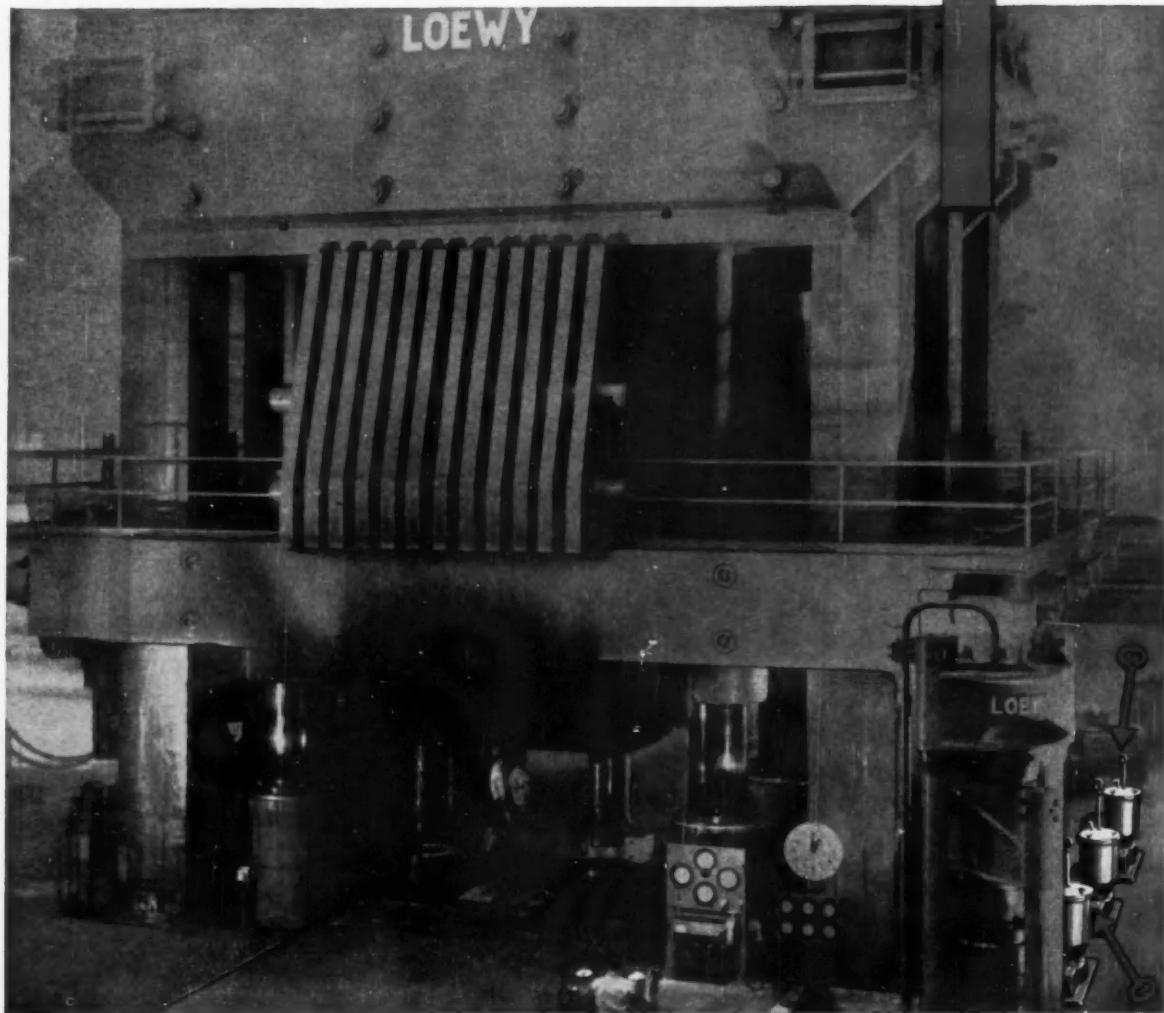
AFFILIATE:

Rotary Seal Division, manufacturers of mechanical seals for rotating shafts. Plants at Chicago, Ill. and Sparta, Mich.



Loewy 50,000-ton "Major" forging press is automatically lubricated by Farval

FARVAL—
Studies in
Centralized
Lubrication
No. 196



It takes only one man at the control pulpit to operate this huge 11-story press—the world's largest machine. Designed and built by Loewy-Hydropress Div. Baldwin-Lima-Hamilton of New York for the U.S.A.F. Heavy Press Program and operated by the Wyman-Gordon Co., it can exert 108 million pounds' pressure to form hot aluminum billets into structural parts for jet planes.

Adequate lubrication—and always dependable—helps this machine work to greater precision tolerances than ever before thought possible in a forging press. Lubrication is by Farval—a total of 205 bearings served by four systems—three heavy-duty automatics for the lubrication of the press proper and one manual for the lubrication of the controls.

Farval Centralized Lubrication Systems are serving millions of bearings in all kinds of industrial equipment. Farval is ready to serve you, too. Call the Farval representative near you, or write us for Bulletin 26-R. The Farval Corporation, 3296 East 80th St., Cleveland 4, Ohio.

*Affiliate of The Cleveland Worm & Gear Company, Industrial Worm Gearing.
In Canada: Peacock Brothers Limited.*

KEYS TO ADEQUATE LUBRICATION—

Wherever you see a Farval central pumping station, dual lubricant lines, and valve manifolds, you know a machine is being properly lubricated.

Three Farval heavy-duty automatic pumping stations that lubricate "Major" are to be seen at lower right.



ZENITH EXPERIENCE IS IN TUNE
WITH TODAY'S CARBURETOR PROBLEMS



ZENITH
CARBURETOR

HAS MORE EXPERIENCE IN

MORE FIELDS WITH MORE ENGINE TYPES THAN ANY
OTHER CARBURETOR MANUFACTURER

ZENITH CARBURETOR DIVISION OF

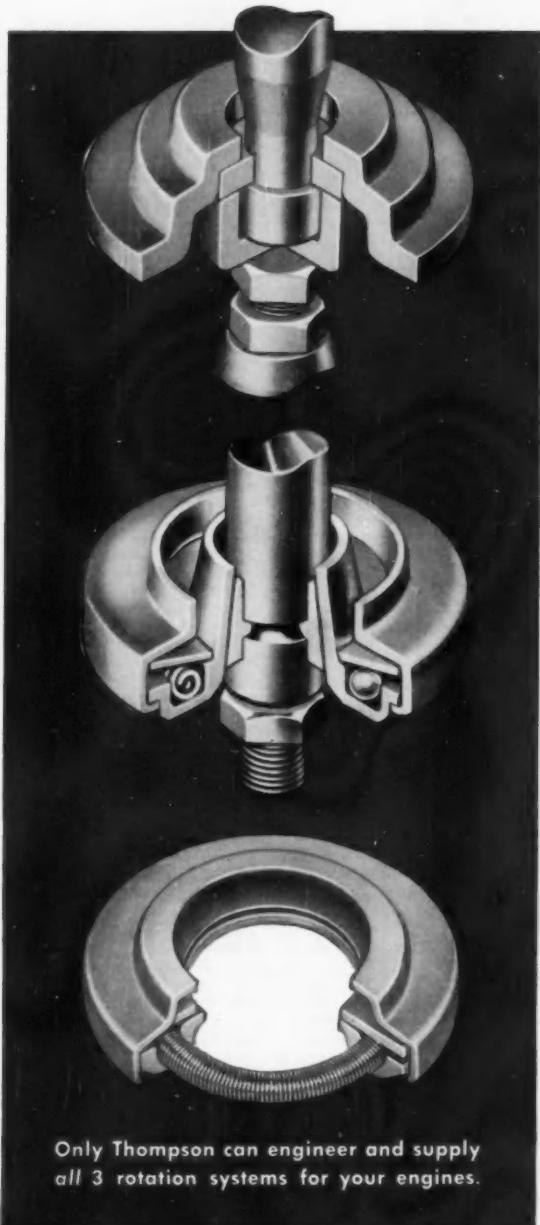
696 Hart Avenue, Detroit 14, Michigan

Export Sales: Bendix International Division, 205 East 42nd St., New York 17, N.Y.

Bendix
AVIATION CORPORATION

Three Types of Valve Rotation

All Thompson developed



Only Thompson can engineer and supply
all 3 rotation systems for your engines.

Pick the Thompson valve-rotation system that
best meets your engine service requirements:

ROTOVALVE

or "free" rotation. Used where normal
engine duty is not severe enough to require
positive-powered rotation—

*✓ Thompson
Developed*

ROTOCAP

for proved positive rotation in measured
stages where severest engine-service con-
ditions are encountered—

*✓ Thompson
Developed*

ROTOCOIL

the latest Thompson rotation development
that provides measured, positive valve
rotation at unit cost competitive with any
other rotation system—

*✓ Thompson
Developed*

Only Thompson can engineer and supply *all three*
rotation systems for your engines. The detailed story
of valve rotation is featured in Thompson Products'
Engineering Bulletin, Vol. 1, No. 3.



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of Steel
Stainless Steel
Brass, Bronze
Monel Metal
and
Special
Materials

for
Over
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Years

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Strom STEEL BALL CO.

Largest Independent and Exclusive Metal Ball Manufacturer

1850 South 54th Avenue, Cicero 50, Illinois

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CALENDAR

OF COMING SHOWS AND MEETINGS

SAE Annual Meeting, Sheraton-Cadillac and Statler Hotels, Detroit, Mich.Jan. 14-18
Society of Plastics Engineers, annual national technical conference, Sheraton-Jefferson Hotel, St. Louis, Mo.Jan. 16-18
Detroit Automobile ShowJan. 19-27
National Motor Boat Show, Coliseum, New York, N. Y.Jan. 19-27
American Institute of Electrical Engineers, winter meeting, Statler Hotel, New York, N. Y.Jan. 21-25
Industrial Economics Conference On Long-Range Company Planning, Fairmont Hotel, San Francisco, Calif.Jan. 21-22
National Automobile Dealers Equipment Exhibition, Civic Auditorium, San Francisco, Calif.Jan. 26-30
Truck Trailer Manufacturers' Association, winter meeting, Cora-mado, Calif.Jan. 27-30
Plant Maintenance & Engineering Show, Public Auditorium, Cleveland, O.Jan. 28-31
Institute of the Aeronautical Sciences, 25th annual meeting, Sheraton-Astor Hotel, New York, N. Y.Jan. 28-31
American Roadbuilders Association, road show and convention, International Amphitheater, Chicago, Ill.Jan. 28-Feb. 2
Automotive Accessories Manufacturers of America, exposition, Coliseum, New York, N. Y.Feb. 4-7
Society of the Plastics Industry, 12th annual Reinforced Plastics Div. Conference, Edgewater Beach Hotel, Chicago, Ill.Feb. 5-7
American Management Association, conference on nucleonics in industry, Statler Hotel, New York, N. Y.Feb. 7-8
SAE National Passenger Car, Body, and Materials Meeting, Sheraton-Cadillac Hotel, Detroit, Mich.Mar. 5-7
Pressed Metal Institute, annual spring technical meeting, Hotel Carter, Cleveland, O.Mar. 6-8
Pacific Automotive Show, Civic Auditorium, Seattle, Wash.Mar. 7-10
Atomic Exposition and Nuclear Congress, Convention Hall, Philadelphia, Pa.Mar. 11-15
National Industrial Conference Board, fifth conference on Atomic Energy, Philadelphia, Pa.Mar. 14-15
Geneva Automobile Show, SwitzerlandMar. 14-24
Society of the Plastics Industry, annual national conference and Pacific Coast plastics exposition, Los Angeles, Calif.Mar. 18-21
SAE National Production Meeting and Forum, Hotel Statler, Buffalo, N. Y.Mar. 20-22
American Society of Tool Engineers, silver anniversary technical meeting and convention, Shamrock Hilton Hotel, Houston, Tex.Mar. 25-27
Western Metal Congress and Exposition, Los Angeles, Calif.Mar. 25-29
American Welding Society, national spring meeting and fifth welding and allied industry exposition, Philadelphia, Pa.Apr. 8-12



in Filter Research

In Dexter, Michigan, close to the automotive capital of the world, is the world's leading filter research center: the **FRAM** Institute of Advanced Filter Research and Design. Here, **FRAM** scientists and engineers are engaged in the continual study of new filtration methods and materials . . . testing new filter systems in the giant **FRAM** Dust Tunnel

and in actual on-the-road test car operations.

Working with automotive manufacturers, **FRAM** engineers design and develop special filter systems to exact specifications and requirements. The facilities and personnel of the **FRAM** Institute are at your disposal. If you have a filtration problem—oil, air, fuel or water—write, wire or phone **FRAM**.

2 NEW PRODUCTS OF FRAM PIONEERING RESEARCH

New **FRAM** Easy Change Oil Filter



Revolutionary new type oil filter—as easy to change as a light bulb. Takes less than 6 minutes to service. Now original equipment on many '57 engines.

New **FRAM** "Filtronic" Carburetor Air Filter



Obsoletes all other air filter types. Patented built-in gasket absolutely prevents by-passing. High filtering efficiency, 99. + %. Original equipment on many '57 engines.

FRAM Corporation
Providence 16, R. I.
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Stratford, Ont.

FRAM
OIL • AIR • FUEL • WATER
FILTERS



THE CASE FOR POWER STEERING ON TRUCKS!

The trend to power steering on trucks is based on one very practical reason—operators of trucks equipped with power steering have invariably found that the added safety and greater operating efficiency of their vehicles have demonstrated that power steering is indeed a sound investment.

Truck drivers using power steering report less tension and fatigue in normal driving and appreciate the positive control that blocks road shock from chuck holes and prevents loss of control if the truck is forced out on a soft shoulder.

The dispatcher knows the importance of regularly maintained schedules. He is quite aware that with power steering drivers are more relaxed and are better drivers than tired drivers. Thus, power steering not only reduces the hazard of road accidents, but helps the driver to maintain established schedules through better vehicle control.

In short, power steering, by saving time and money, contributes materially to a more profitable operation.

Truck manufacturers are always eager to offer their customers features

that will make truck operation safer and more profitable and, at the same time, give their dealers every selling advantage.

That's why more and more truck manufacturers are offering performance-proven Bendix* Power Steering as original factory equipment.

If you would like to know why power steering for trucks is perhaps even more logical than power steering for passenger cars, we have prepared an interesting folder on the subject.

Write for your copy today. We think you'll be convinced.

*REG. U.S. PAT. OFF.

Bendix PRODUCTS DIVISION **South Bend IND.**



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High Spots of This Issue

★ Industry Previews and Reviews

The year 1956 proved to be one of adjustment in certain areas after the zenith of 1955, although Gross National Product climbed. Just about every portent for 1957 is good, as seen in this analysis. Page 48.

★ Large Germanium Rectifiers Used in Plating Facility

Rheem Automotive, a division of Rheem Mfg. Co., has installed in its Fullerton, Calif., plant outstanding new bumper plating facilities. Its special features, such as the use of germanium rectifiers, are detailed. Page 50.

★ Automotive Forecast for 1957

While 1956 did not live up to the automobile industry's hopes, it goes down in history as the fourth best in production and third best in retail sales. Soothsayers look for an upturn in 1957 with cautious optimism. Page 54.

★ Czechoslovak Motor Industry

In spite of a current annual car production rate of only 20,000 units, Czechoslovakia is pushing hard to raise this figure. This behind-the-scenes report analyzes the situation and the expansion steps being undertaken. Page 56.

★ Press and Welding Setups at British Briggs Plant

Important part of the \$180 million expansion program of British Ford is the modernization of its Briggs Motor Bodies subsidiary. Described here is the new press, welding, and other equipment being installed. Page 62.

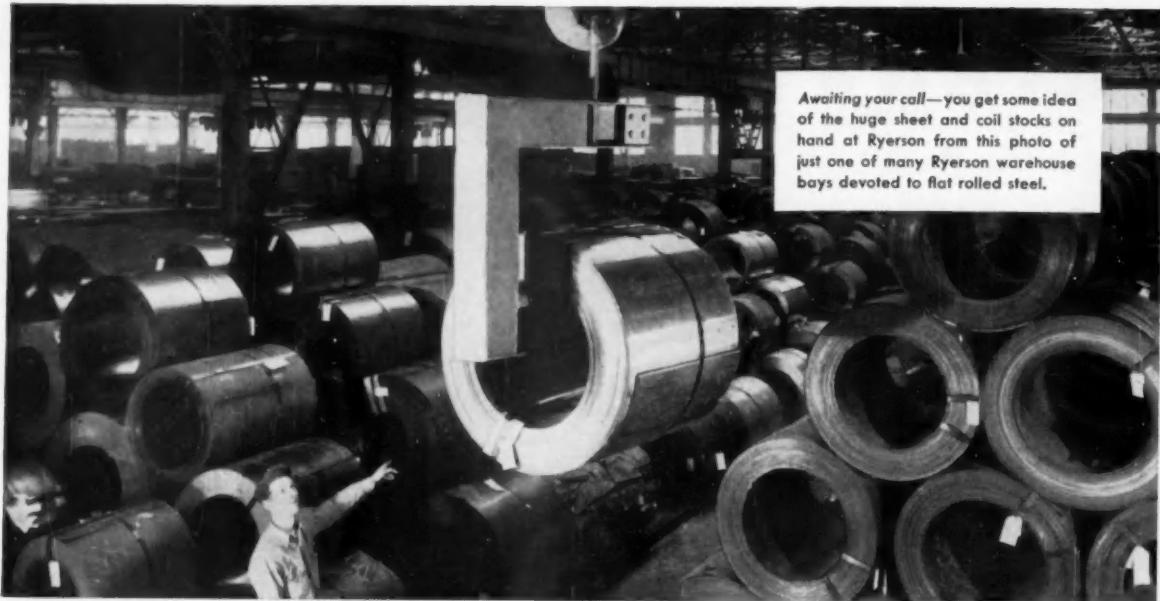
★ 37 New Product Items And Other High Spots, Such As:

Marvel-Schebler fuel injection system; aircraft industry expansion; truck body assembled on merry-go-round setup; Timken-Detroit planetary axle line; Minicars replace motorcycles in Germany; West German Air Force; working space increased; cemented carbide dies; grinding connecting rods; air springs; and aluminum in 1957 cars.

Complete Table of Contents, Page 3

Automotive and Aviation News, Page 33

AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES
• BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT
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Awaiting your call—you get some idea of the huge sheet and coil stocks on hand at Ryerson from this photo of just one of many Ryerson warehouse bays devoted to flat rolled steel.

On sheet and strip requirements... are YOU getting this 3-point service?

Sheet and strip buyers tell us that three kinds of purchasing help keep them coming back to Ryerson:

1. WIDER SELECTION OF TYPES—More than 20 kinds of sheet and coil stock are on hand in an unusually wide range of gauges—making it easier to get the exact steel needed for any requirement.

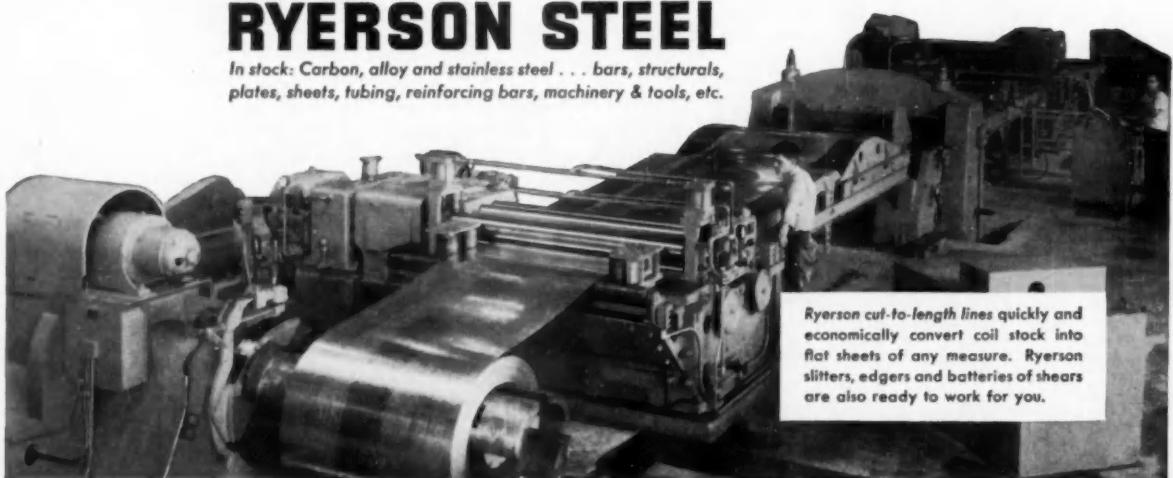
2. GREATER PROCESSING CAPACITY—The most extensive cutting and processing facilities in the steel-service industry enable buyers to get quickest service on requirements for special sizes, strip and sketch cutting, blanks, slit coils, edging, or any other processing.

3. HELP ON SHEET AND STRIP PROBLEMS—The large Ryerson staff of sheet and strip specialists gives buyers a valuable source of help in selecting the most satisfactory and economical stock—or in solving any other problem of application and fabrication.

In addition, sheet and strip buyers like the good packaging, the dependable weight and on-schedule delivery that they get from Ryerson—and the convenience of one-order buying of all steel products from the same source. So call your nearby Ryerson plant for 3-way help on sheet and strip needs.

RYERSON STEEL

In stock: Carbon, alloy and stainless steel . . . bars, structural, plates, sheets, tubing, reinforcing bars, machinery & tools, etc.



Ryerson cut-to-length lines quickly and economically convert coil stock into flat sheets of any measure. Ryerson slitters, edgers and batteries of shears are also ready to work for you.

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • WALLINGFORD, CONN. • PHILADELPHIA • CHARLOTTE • CINCINNATI
CLEVELAND • DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 116, No. 2

January 15, 1957

Chrysler Revises Ad Program; Suggested List Prices Go Up

The price gap between Plymouth and Chevrolet has been narrowed further. This has come about as a result of changes made by Chrysler Corp. in its cooperative advertising program.

Under the new program, Chrysler—like General Motors—will now assume full responsibility for the cost and administration of advertising funds on both the national and local levels. Dealers were formerly required to contribute certain amounts to the advertising fund. The corporation will now add these costs to the dealers' car invoice price.

Suggested list prices on all Chrysler lines will be increased by from \$20 to \$75. General Motors posted increases ranging from \$28 to \$92 in its suggested list prices after changes in its own advertising program.

The result is that the Plymouth suggested retail price has been brought still closer to Chevrolet's. The actual increased cost to the Plymouth dealer amounts to about \$3.95. This includes excise tax and the customary markup on the wholesale price. Under GM's new program, the actual increased price to the Chevrolet dealer amounts to \$8, including the excise and markup.

Changes In Dealer Franchises To Be Told by Ford Next Month

The long expected changes in the Ford Motor Co. dealers' franchise will be announced to dealers in early February. Details are still secret, but Ford has stated that the new franchise will encompass progressive moves that will serve as a model for other companies.

The story on the new contract will be told to Ford's more than 10,000 dealers over a closed circuit television



SUPERIOR INTRODUCES RESTYLED AMBULANCE LINE

The 1957 line of ambulances and rescue cars offered by Superior Coach Corp. is available in three models. Built on a 1957 Cadillac chassis, they incorporate a number of new features for safety, convenience, and efficiency in actual operation. Added headroom is obtained by raising roof deck between center pillar and back door.

network. At the same time, further details about the company's plans for the new Edsel car also will be released to the dealers.

Multiple Carburetors Offered By Pontiac in New Power Kits

Two new engine "power packs," both including a triple two-barrel carburetor installation similar to that brought out by Oldsmobile recently, are being offered by Pontiac. One is designed to boost engine output to 290 hp and is available only on cars equipped with the Hydra-Matic.

The other, boosting horsepower to 317, is primarily for racing enthusiasts and is available with both Synchromesh and Hydra-Matic transmissions. The installation is called "Tri-Power."

In addition to the multiple carburetors, the "race car" engine includes such modifications as a harmonic balancer and valve lifters with special tuning, a generator with increased pulley diameter, and heavier valve springs. The extra horsepower also is provided through improved engine breathing.

Kelsey-Hayes Changes Name To Reflect New Operations

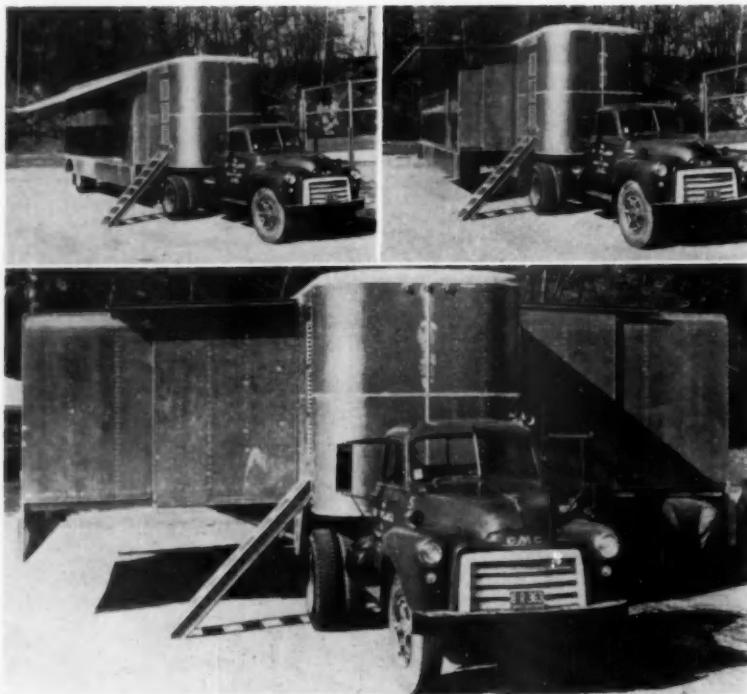
To reflect its broadened activities more accurately, the name of Kelsey-Hayes Wheel Co. has been shortened to Kelsey-Hayes Co. Within the past few years Kelsey-Hayes has been diversifying into a number of different fields through acquisitions of other companies, which now operate as subsidiaries.

Wheels, brakes, and related items, still constitute the company's main products. However, its expanded operations now include many non-automotive products, including aircraft parts and various types of hand tools.

Millionth Power Steering Unit Installed By Buick

Buick last month (Dec.) installed its one millionth power steering unit. First offered by Buick in 1952 on its Roadmaster models only, power steering currently is being installed on 60 per cent of the division's production. This compares with 56 per cent for the 1956 model run and 49 per cent for 1955.

News of the AUTOMOTIVE



TRAILER BALLOONS IN SIZE AT TOUCH OF BUTTON

This 14-ton truck-trailer, manufactured of Alcoa aluminum by Gerstenslager Co., expands to more than five times its on-the-road dimensions of 35 ft long and 8 ft wide at the touch of a button. Sides telescope outward, while accordion-folded aluminum floors drop into place to form interior dimensions of 30 ft long, 26 ft wide, and 7½ ft high when fully expanded. The process is powered by electrically operated hydraulic and chain drive mechanisms. Potential uses of the trailer, which contains more than 12 tons of aluminum extrusions, sheet, plate, and castings, range from a military service vehicle to a mobile home or traveling industrial exhibit showcase.



REAR QUARTER PANEL OF ALUMINUM IS VISUALIZED

Indicative of possible future applications of aluminum to automobiles is this rendering by Reynolds Metals Co. of an idea for producing a section of a rear quarter panel. This component incorporates in a single aluminum stamping a primary body panel, its embossed decor, identification script, emblem, and edge moulding.

'57 De Soto Adventurer Has Higher Displacement Engine

De Soto has introduced a 1957 version of the Golden Adventurer as a successor to the two-door Fireflite hardtop presented in 1956. It was publicly displayed for the first time Jan. 5 at the Chicago Automobile Show.

The new Adventurer is powered by a modified Fireflite S-26 engine which develops 345 bhp at 5200 rpm. Bore and stroke are 3.80 in. and 3.80 in., respectively; displacement, 345 cu. in.; compression ratio, 9.25 to 1; and torque, 355 ft lb at 3600 rpm.

Increased displacement of the engine is teamed with a special high-performance camshaft, heavier valve springs, dual four-barrel carburetors, and dual-breaker distributor.

McCulloch Supercharger Is Offered On Ford V-8s

Ford Div. is now offering a supercharger as a factory-installed option. Developed jointly by Ford and McCulloch Motors Corp., the unit will be available across the board with the 312 cu in. Thunderbird V-8 engine. Coupled with a standard four-barrel carburetor, it will boost horsepower from 285 to 300. Compression ratio is 8.5 to 1.

The supercharger is a centrifugal type. The supercharged engine carries a suggested list price of \$447 extra.

New Factory Sales Organization Set Up At S-P in South Bend

Now that all Packard and Studebaker sales administration activities have been consolidated in South Bend, a new factory sales organization has been formed to handle the integrated operations of the two lines of cars and trucks. The sales group includes six departments with new managers named to head up each one. The departments and their managers include merchandising, to be headed by James W. Orr; truck sales, Clare L. Hitchcock; service, Roy B. Bender; car and truck fleet sales, Allan E. Fitzpatrick; car distribution, Theodore A. Zensinger; business management, James O. Lewis.

AND AVIATION INDUSTRIES

Mercury Convertible Chosen To Pace Indianapolis Race

A Mercury Convertible Cruiser, which was added to the division's 1957 line of cars early this month, has been selected as the pace car for the 41st annual 500-mile Indianapolis race, to be run May 30. It will represent the most powerful car ever used to lead the Memorial Day classic.

The car carries Mercury's 368 cu in., 290-hp, V-8 engine. Francis C. Reith, Mercury's general manager, will drive the car.

This year's race is expected to draw more than 60 entries. An average speed of 140 mph probably may be necessary to earn one of the starting positions.

Since the last race the track has undergone a number of innovations. A new 1300-ft-long pit area, new control tower and tower terrace seats, and a new three-lane vehicle tunnel under the back stretch have been installed.

Edsel Car To Be Made In Two Price Classes

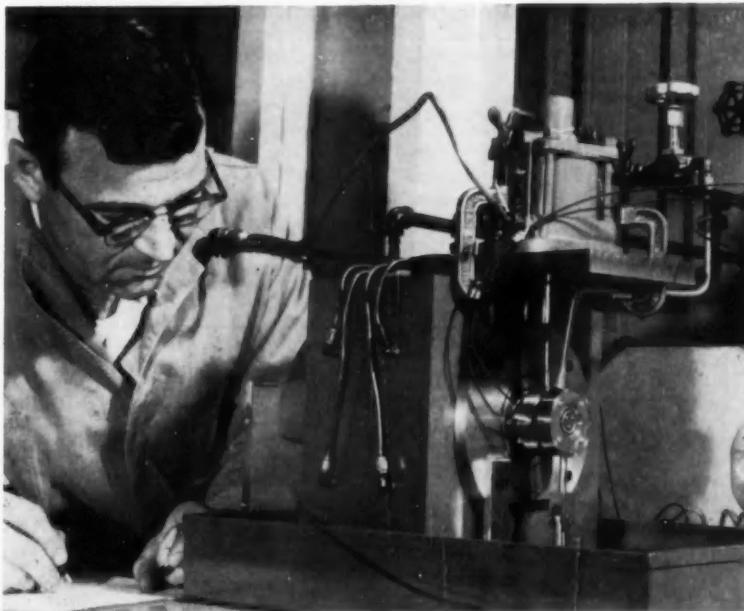
Ford's new Edsel car, to be introduced next fall, will bracket the Mercury. One line will be priced between Ford and Mercury and the other between Mercury and Lincoln. The division is busily signing up new dealers, and is urging them to get strongly established in service operations.

Car Production Gets Started At Ford's New Claycomo Plant

Supplemental details about Ford Division's newest assembly plant in Claycomo, Kans., have been released. It will have the capacity to produce an average of 28 per cent more cars and trucks in an eight-hour day than the 44-year-old Kansas City plant which it replaces.

Daily output at the new facility will be about 432 vehicles, compared with 336 in the old plant. The first car came off the line at the Claycomo unit on Jan. 7.

It took Ford nearly two years to convert and expand the plant from aircraft production to automotive as-



BALL BEARINGS SPIN FASTER THAN SPEED OF SOUND

Ball bearings spinning at 120,000 rpm are tested in the recently opened Bearing and Lubricant Center of General Electric Co. at Schenectady, N. Y. It combines in one location bearing and lubricant development facilities formerly divided between the Thomson Laboratory of the Lynn, Mass., River Works and the General Engineering Laboratory in Schenectady. It is equipped to carry on advanced development work.

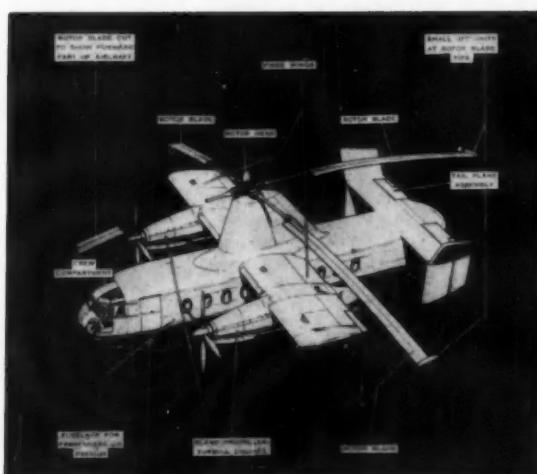
sembly on a gradual basis. A phase-out of B-47 wing production was accomplished simultaneously. Since the military contract expired last June the company has been stepping up its

plans to get the plant going on automobile assembly. Actually, it was not scheduled to start production until spring.

(Turn page, please)

BRITISH
COPTER

Expected to make its first flight early in 1957 is the Fairey Rotodyne helicopter. Rotor of the 40-passenger, fixed-wing aircraft is tip-driven by small jet units on the tips of the stainless steel blade. Forward thrust is provided by two Napier Eland turboprop engines.



News of the AUTOMOTIVE

In addition to increased capacity, the Claycomo plant is able to assemble all of Ford's 23 car body types. The old Kansas City unit could accommodate only five.

Cars and trucks are assembled on separate lines. Each assembly system includes such auxiliary operations as wheel painting, tire mounting, engine preparation, cushion assembly, and front-end assembly.

The 1.3 million sq ft Claycomo plant

incorporates the latest engineering techniques and materials handling methods. Outstanding among these are a rail dock inside the plant which can accommodate 52 freight cars at one time; motorized "tow trains" and fork lift trucks for transferring parts; and a paint supply system made up of more than 24 miles of 1 1/4-in. pipe. It carries 15 enamel colors, two prime body paints, and one black enamel for chassis spray.

1956 WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	For Weeks Ending				Calendar Year 1956
	Dec. 29	Dec. 22	Dec. 15	Dec. 8	
PASSENGER CAR PRODUCTION					
Hudson	73	111	140	110	22,485
Nash	215	383	464	381	54,715
Rambler	1,299	2,139	2,554	2,098	26,652*
Total—American Motors	1,547	2,633	3,158	2,589	103,852
Chrysler and Imperial	2,730	3,286	3,750	3,881	107,496
De Soto	2,425	3,564	3,566	3,727	104,074
Dodge	4,723	6,890	7,092	8,262	205,632
Plymouth	8,555	13,904	15,000	15,288	452,877
Total—Chrysler Corp.	18,433	27,644	29,408	30,958	870,089
Ford	26,582	41,367	41,351	40,898	1,373,542
Lincoln and Continental	913	1,214	1,230	1,250	48,395
Mercury	5,190	7,804	7,265	7,203	246,626
Total—Ford Motor Co.	32,665	50,385	49,846	49,351	1,609,165
Buick	9,423	14,638	14,490	15,897	535,264
Cadillac	3,039	4,290	4,337	3,815	140,673
Chevrolet	21,341	35,927	37,648	41,582	1,621,019
Oldsmobile	6,896	10,570	10,987	12,251	432,904
Pontiac	4,981	6,105	6,181	9,423	332,266
Total—General Motors Corp.	45,480	71,828	73,053	82,738	3,662,428
Packard	130	13	0	0	13,432
Studebaker	1,291	2,516	2,483	1,768	82,955
Total—Studebaker-Packard Corp.	1,421	2,529	2,493	1,768	96,387
Checker Cab	15	55	83	174	3,900
Total—Passenger Cars	99,551	155,074	156,641	167,576	5,805,881
TRUCK PRODUCTION					
Available	6	3	7	5	361
Chevrolet	5,181	7,886	7,929	7,681	353,512
G.M.C.	1,129	1,824	1,727	1,761	91,485
Diamond T	0	85	84	85	5,033
Dixie	46	69	80	80	3,586
Dodge and Fargo	1,443	2,193	2,022	2,001	91,383
Ford	469	4,922	6,097	6,095	297,306
International	2,147	3,061	3,393	3,420	137,839
Mack	298	397	384	378	18,304
Reo	0	61	90	52	3,789
Studebaker	246	340	401	347	15,222
White	191	314	314	309	17,357
Willys	1,193	1,851	1,589	1,794	64,883
Other Trucks	85	95	87	100	7,615
Total—Trucks	12,436	22,983	24,204	24,108	1,107,887
Buses	39	86	87	79	4,187
Total—Motor Vehicles	112,026	178,143	182,912	191,783	6,917,725

* Prior to week ending Sept. 1, 1956, Rambler production was included with Nash and Hudson.

GM Ups Destination Charges; Ford, Chrysler May Go Along

General Motors Corp. has increased its destination charges an average of four per cent as a result of higher freight rates put into effect recently by the railroads and impending increases by automobile haulaways.

The new prices will apply only to cars shipped from outlying assembly plants. While this point was not clarified, indications are that the new freight charge would vary proportionately with the distance from the home plants. Increases in some parts of the country would amount to more than four per cent. Ford and Chrysler are said to be studying their freight programs also.

Studebaker-Packard Modifies Dealer Franchise Agreements

Studebaker-Packard Corp. has joined other automobile companies in revamping its franchise agreements with dealers. The new contracts incorporate five major changes, in addition to a number of minor concessions.

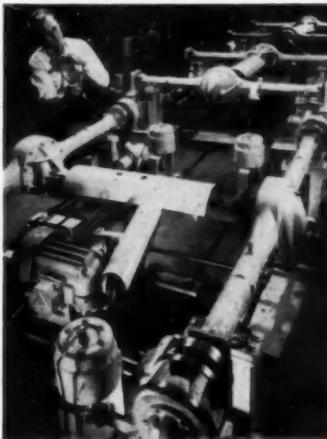
Among the more important are a 100 per cent labor warranty recovery clause, similar to one granted by the Big Three and American Motors; a three-year contract, with automatic renewal for one year; a five per cent rebate on all unsold new cars on hand at new-model introduction time; a clause which will permit dealers to exchange obsolescent parts and accessories for new ones up to four per cent of his purchases; and provisions for postponing termination of the franchise for from 90 days to a year in the event of a dealer's death.

The new franchise became effective Jan. 1. The dealer cooperative advertising program remains unchanged.

Chevrolet Stepping Up Turboglide Production

Chevrolet finally is getting Turboglide production up to the desired point. It had shipped only a few thousand cars with the new transmission by the end of last year, but now is rapidly pushing output up to 12,000 units this month. By March production is expected to reach 35,000 a month, the scheduled maximum rate.

AND AVIATION INDUSTRIES



WHEEL BEARING TEST

Listening in on a stethoscope, a technician in the Chevrolet Engineering Center's laboratory checks rear wheel bearings undergoing a durability test. The electric motor mounted between the rear axle drives them the equivalent of 50,000 miles. Loads equal to five passengers are applied through pressurized air cylinders on either end of the axles. Any flaws in the bearings can be detected through the stethoscope by a hum or tapping.

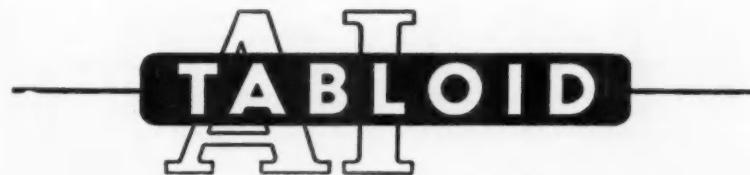
Fruehauf Gets Two Contracts For Special Truck Trailers

Fruehauf Trailer Co. has received two subcontracts for production of special truck-trailers for the Government. One, valued at \$5 million, is from Western Electric Co. for production of trailers for ground handling and housing of control equipment for the Nike missile.

The other contract is from Douglas Aircraft Co. for production of special missile loading trailers valued at \$1.5 million. The special trailers will be built at Fruehauf's Los Angeles plant.

Kelsey-Hayes Co. to Construct New Plant Near Springfield, O.

Kelsey-Hayes Co. will build an 80,000 sq ft factory on a 68-acre site northwest of Springfield, O., for its Steel Products Engineering Div. The new factory marks the first step in the company's plans to expand the division. When completed, the plant will employ between 200 and 300 persons, it is estimated.



Carborundum Co. will build a new multi-million dollar plant in Van Wert, O., for the manufacture of high volume, small abrasive wheels.

Republic Aviation (International) S. A. has contracted with Weser Aircraft Co. of Germany to provide industrial support for the new German Air Force.

General Electric Co. has postponed three proposed construction projects. No effect is expected, however, on the company's plans to spend \$500 million on expansion during the next three years.

Westinghouse Electric Corp. has developed a new aluminum-clad copper wire.

Phoenix Iron & Steel Co. plans to construct a fully-integrated steel mill in southern New Jersey.

Crescent Co., Inc., is acquiring Lowell Insulated Wire Co. . . . W. J. Voit Rubber Corp. has been purchased by American Machine & Foundry Co.

Maserati de Mexico, S. A., has been formed in Mexico City to produce the Maserati scooter.

Kloeckner-Humboldt-Deutz AG. recently turned out its 250,000th Deutz aircooled Diesel engine.

Timken Roller Bearing Co.'s Steel and Tube Div. recently completed a \$1.25 million expansion program of its tube mill.

Flick-Reedy Corp. is building a \$2.3 million plant near Chicago with a unique heat pump.

Worcester Pressed Steel Co. has announced the successful deep drawing of titanium alloys.

General Electric Co. has developed a potentially super-strong magnet working with invisible iron "dust."

Harrison-Radiator Div. of General Motors Corp. is now devoting about 20 per cent of its activities to the production of automobile air conditioning systems.

American Management Association has formed a research and development division.

Paul M. Garrett, retired vice-president in charge of public relations for General Motors Corp., has opened his own office at 629 Fifth Ave., New York 20, N. Y.

U. S. Steel Corp. is purchasing the Chicago Hegewisch Ordnance Div. plant of U. S. Industries, Inc.

Ajax Engineering Corp. and Ajax Electric Furnace Corp. are combining their engineering, manufacturing, and sales efforts.

Major Mexican airlines are considering using gas turbine engines on their national and international routes.

Steel capacity of the U. S. increased by five million ingot tons in 1956.

Standard Oil Co. of N. J. has earmarked \$1.25 billion for capital expenditures in 1957.

Lukens Steel Co. will finance a major portion of a planned \$40 million expansion program with loans from its customers.

Curtiss-Wright Corp. has opened a branch sales office at 208 South LaSalle St., Chicago, Ill.

News of the AUTOMOTIVE

SLIGHT UPTURN SHOWN IN SALES AS NEW CARS BOW

1956 New Passenger Car Registrations*

Arranged by Makes in Descending Order According to the 1956 Ten Months' Totals

MAKE				TEN MONTHS		Per Cent of Total
	October 1956	September 1956	October 1955	1956	1955	
Chevrolet	114,633	116,519	139,822	1,323,660	1,359,071	26.29
Ford	109,150	87,282	130,936	1,119,886	1,289,541	22.23
Buick	33,772	40,604	62,188	464,902	646,952	9.23
Plymouth	27,896	31,117	42,148	405,528	557,920	8.05
Oldsmobile	31,053	32,148	47,165	381,548	501,646	7.57
Pontiac	26,316	25,310	40,323	308,875	448,213	6.13
Mercury	19,785	21,860	31,437	239,009	312,676	4.74
Dodge	14,070	15,400	25,336	184,001	244,132	3.67
Cadillac	7,562	10,903	5,406	117,472	113,957	2.33
Chrysler	7,487	8,325	10,011	101,235	132,825	2.01
De Soto	6,609	6,960	7,845	85,614	99,736	1.70
Nash	6,360	6,007	7,648	70,016	81,963	1.39
Studebaker	3,794	4,742	7,069	68,168	83,724	1.31
Lincoln	3,155	2,819	3,507	38,380	27,588	.72
Hudson	1,810	2,064	3,128	28,036	38,366	.56
Packard	1,357	1,837	4,458	26,749	44,527	.53
Continental	66	87	129	1,331	129	.03
Misc. Domestic	364	327	328	3,308	7,074	.07
Foreign	9,184	6,800	5,891	72,714	41,628	1.44
Total—All Makes	424,414	421,021	578,045	5,037,239	6,041,768	100.00
						100.00

* Based on data from R. L. Polk & Co.

Mercury Hikes Car Output By 43 Per Cent This Month

The automobile industry continues to operate at a high level to meet current orders and to build up stocks for spring selling. Mercury's output this month, for example, has been boosted to 40,000 units, 43 per cent above December's 28,000.

The stepped-up output at Mercury

contrasts with some reports that "soft spots" have begun to develop in the medium and low-medium price classes. It is true, of course, that a few manufacturers have cut back production schedules slightly. However, many are continuing to operate at near peak levels to fill orders.

TOTAL FOR TEN MONTHS OFF 26,000 UNITS FROM 1955

1956 New Truck Registrations*

Arranged by Makes in Descending Order According to the 1956 Ten Months' Totals

MAKE				TEN MONTHS		Per Cent of Total
	October 1956	September 1956	October 1955	1956	1955	
Chevrolet	25,604	24,146	33,430	255,198	268,729	33.51
Ford	23,146	21,887	23,673	227,470	246,346	29.86
International	9,317	9,156	8,185	92,735	86,177	12.17
G. M. C.	6,297	6,583	8,609	70,471	67,218	9.25
Dodge	4,417	4,394	5,680	48,515	56,056	8.37
White	1,260	1,206	1,476	13,078	11,919	1.72
Willys Truck	1,346	1,201	1,569	11,405	13,455	1.50
Mack	1,196	1,050	1,078	11,219	8,839	1.47
Studebaker	469	635	813	7,658	9,363	1.01
Willys Jeep	912	861	1,059	7,315	8,274	.98
Diamond T	403	286	376	3,451	3,066	.45
Dixie	257	262	296	2,737	2,603	.38
Reo	316	235	345	2,577	2,573	.34
Kenworth	104	114	170	1,131	977	.15
Brockway	53	46	106	764	882	.10
Peterbilt	42	47	57	539	378	.07
F. W. D.	39	24	24	373	219	.05
Misc. Domestic	131	144	91	1,012	612	.13
Foreign	700	436	233	4,068	1,682	.53
Total—All Makes	76,062	72,420	87,282	761,714	787,728	100.00
						100.00

* Based on data from R. L. Polk & Co.

Sealed Power Corp. Relights Engineering, Manufacturing

Sealed Power Corp., Muskegon, Mich., has split its Manufacturing and Technical Engineering Div. into two separate divisions. Each will be headed by individual company executives.

Donald M. Hesling, former vice president of the combined division, will now head the new Engineering Div. Beryl T. Pickel, general manufacturing manager, will be in charge of the new Manufacturing Div.

Three-Tone Paints Available On Trio of Pontiac '57 Cars

Three-tone paint color combinations, which reached a height of popularity on 1956 model cars, but are offered on only a few 1957 makes so far, are coming back at Pontiac.

The company has announced it would offer the triple paint combinations on its Deluxe Star Chief, Super Chief and Chieftain models. The third color will be applied to the center "belt," or molding.

New Car Inventories Cut to 30-Day Supply

Automobile dealers are starting out 1957 with a much more favorable inventory condition than a year ago. It is estimated that the supply now stands at a little more than 500,000 cars, about 200,000 under a year ago and a little less than a 30-day supply. Car factories are watching field stocks very carefully and will adjust production as soon as they detect any undue build-up.

Correction

It was erroneously stated on page 37 of the Dec. 15th issue of AUTOMOTIVE INDUSTRIES that Walter Motor Truck Co. will erect a truck body plant at Voorheesville, N. Y. The company has advised that it will not build motor truck bodies at the Voorheesville plant, on which construction has started. Instead, it will be used to manufacture the Walter military fire truck that the company developed for the Corps of Engineers.

AND AVIATION INDUSTRIES

New Franchise Concessions Granted AMC Car Dealers

American Motors' new franchise agreement, announced in December, has several provisions similar to those made by General Motors last February. Provisions for absorbing costs in dealer terminations; succession in case of death; four per cent rebate on all unused new cars carried over into a new model year; 90-day parts return; and 100 per cent labor warranty recovery are similar to those of General Motors.

American Motors, however, did not alter its dealer advertising program or procedure for termination. Also, the factory will determine whether individual contracts will be of one or three years' duration.

Another new feature is that franchises now are written with American Motors Corp. There is a separate stipulation as to which lines (Nash, Hudson, or Rambler) are covered.

The new franchise was effective on Jan. 1. However, the 100 per cent warranty labor provision was put into effect last July 1 but never announced.

Lincoln Production for 1956 Breaks Eight-Year-Old Record

Lincoln Div. starts out 1957 with a record year behind it.

In moving ahead to new heights, it broke an eight-year-old production record.

The division finished the year with a production total of approximately 47,600 cars. This was nearly 4000 units above the previous record of 43,688, established in 1948, and well ahead of 1955 output.

Final Budd 1956 Figures Seen Up; Further Diversification

Earnings of the Budd Co. totaled \$7,604,336 on sales of \$231,933,210 during the first three quarters of 1956. These figures will be improved somewhat during the fourth quarter, according to Edward G. Budd, Jr., president, in a year-end statement.

In a review of developments during 1956, Mr. Budd attached particular significance to Budd's continuing progress in its diversification program.



SUBTERRANEAN WAREHOUSE IS DUG BY ROCKETDYNE

Assembly line production of liquid-propellant rocket engines will be launched shortly at Neosho, Miss., by Rocketdyne, a division of North American Aviation, Inc. Warehousing is centered in an underground cave created when limestone was quarried from a hillside (top photo). Entrance is through the truck entrance to the left, or the railroad spur to the right. Bottom photo shows a portion of a total of 600,000 sq ft of underground space available in the hillside for storage purposes.

He mentioned that further diversification in a different direction in the aircraft field is contemplated. At the present time, the company is heavily engaged in the manufacture of jet

engine components and is delivering about \$1 million worth of finished products monthly under current schedules.

(Turn to page 94, please)

1956 RETAIL CAR SALES BY PRICE GROUPS*

Number of Cars

Price Group	1956		1955		1956		1955	
	Units	% of Total	Units	% of Total	Units	% of Total	Units	% of Total
Under \$2,000	17,629	4.25	180,670	31.73	831,481	16.75	3,191,556	52.83
\$2,001 to \$2,500	268,945	64.30	321,408	56.39	2,783,870	56.09	2,039,582	33.76
\$2,501 to \$3,500	116,545	28.07	52,595	9.23	1,146,896	23.15	842,346	10.63
Over \$3,500	14,012	3.38	15,119	2.65	198,890	4.01	167,631	2.78
Total	415,131	100.00	589,990	100.00	4,963,139	100.00	6,041,315	100.00

Dollar Volume of Sales

Price Group	1956		1955		1956		1955	
	Dollars	% of Total	Dollars	% of Total	Dollars	% of Total	Dollars	% of Total
Under \$2,000	\$ 34,131,572	3.45	\$ 340,213,731	26.85	\$ 1,827,679,072	14.00	\$ 6,056,424,683	45.82
\$2,001 to \$2,500	578,763,880	58.50	718,914,177	56.73	5,987,818,912	81.50	4,729,497,311	35.62
\$2,501 to \$3,500	316,608,265	32.00	146,243,900	11.54	3,159,285,849	27.17	1,811,601,380	13.64
Over \$3,500	59,826,129	6.05	61,844,224	4.88	852,855,052	7.33	679,934,672	5.12
Total	\$ 909,329,826	100.00	\$ 1,267,216,032	100.00	\$ 11,527,638,885	100.00	\$ 13,277,458,245	100.00

*Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four door sedan or equivalent model. Does not include transportation charges or extra equipment.

†New registrations of American made cars only. Does not include imported foreign cars.

Men in the News



Gunite Foundries Corp.—E. C. Fales was named president and general manager.

Thompson Products, Inc.—G. R. Moore has been named staff vice-president for sales and advertising, and Benjamin W. Chidlaw has been appointed chairman of the Planning Committee.

Gunite Foundries Corp.—Duncan P. Forbes has become chairman of the board.

H. K. Porter Co., Inc.—T. M. Evans has been elected chairman, and Charles L. Holbert has been elected president.

Willys-Overland Export Corp.—William S. Pickett was elected vice-president in charge of sales.

Snyder Tool & Engineering Co.—S. David Harrison has been elected treasurer.

Fellows Gear Shaper Co.—Wallace H. Dodge has been named factory manager to succeed H. T. Gates, retired. John E. Angell has been appointed factory controller, succeeding Charles H. Winkler, retired.

Kearney & Trecker Corp.—Ralph W. Burk and Raymond L. Bischoff were named directors. Morris L. Hutchins was made vice-president in charge of engineering; E. A. Perkins, treasurer and assistant secretary, and Harry G. Thelen, secretary.

Oldsmobile Div., General Motors Corp.—Jack P. White has been appointed director of public relations.

Kenworth Motor Truck Co.—Lewis T. Gerlach was named general sales manager.

General Electric Co.—William S. Ginn and Jack S. Parker have been elected vice-presidents.

Westinghouse Electric Corp.—Charles D. Duffy has been named general traffic manager.

Fries Instrument Div., Bendix Aviation Corp.—Donald C. McDonald has been appointed director of engineering.



Bullard Co.—John P. Path has been named director of engineering, and Edmund J. Lomazzo has been made assistant chief engineer.

Giddings & Lewis Machine Tool Co.—Erwin J. Kaiser has been named staff vice-president for manufacturing, and George K. Cassady succeeds him as general manager of the Davis Boring Tool Div. Guy E. Lingenfelter has become sales manager of the G&L and Hypro Div.

Tung-Sol Electric, Inc., Automotive Div.—Charles H. Becker has been named manager.



American Motors Corp.—L. E. Stewart has been appointed manager of the Midwestern Div., and W. A. Fullerton has been named manager of the Central Div.

GMC Truck and Coach Div., General Motors Corp.—D. J. LaBelle was made truck engineer.

Enjay Co., Inc.—J. P. Haworth is now manager of the Eastern Sales Div., and H. C. Evans has become Akron District manager.

Pennsylvania Salt Mfg. Co., Industrial Div.—George R. Lawson was made director of marketing.

AMP, Inc.—John S. Garceau was appointed director of publicity.

Massey-Harris-Ferguson Ltd.—Albert A. Thornbrough has been appointed president.

Eaton Manufacturing Co.—Robert V. Lundskow has been appointed assistant to the director of advertising.

Delman Co.—W. G. Kilpatrick is now plant manager.

Clark Equipment Co.—Frank E. Juranek has become general traffic manager.



Bell Aircraft Corp.—Francis A. Dunn is now assistant to the president, and William A. Boles succeeds him as director of public relations.

Joseph T. Ryerson & Son, Inc.—Alfred J. Olson has been named general sales manager for the Chicago plant, and is succeeded as sales manager by Robert A. Daggitt and Scott Vrooman. Louis W. Werthman is now sales manager for the San Francisco Bay Area plant.

General Electric Co.—Herbert E. Ihrig is now manager of marketing administration and personnel development for the Metallurgical Products Dept.

Russell, Burdsall & Ward Bolt and Nut Co.—Duke A. Garrison and Frederick E. Graves have been appointed assistants to the vice-president in charge of engineering and research.

General Tire & Rubber Co.—Donald L. Dewing is now director of quality control.

Diversey Corp.—Bland B. Button is now vice-president of sales.

Korfund Co.—Bela K. Erdos has been elected president.

George W. Borg Corp.—Byron C. Booth has been elected president, and G. Marshall Borg has been named vice-chairman of the board of directors.

Lewis-Shepard Products, Inc.—Russell B. Mason is now public relations manager.

Bell Helicopter Corp.—Harvey Gaylord has been named president.

Heald Machine Co.—E. Bruce Crabtree is now branch manager of the Dayton sales office, and Homer R. Geoffrion has become Branch Manager of the Indianapolis Sales Office.

Arvey Corp.—James E. Orvis was named director of industrial and public relations.



Michigan Tool Co.—
A. D. Moncrieff was
elected a vice-president and made manager of the Machine and Tool Div.

AC Spark Plug Div., General Motors Corp.—Martin J. Caserio has been promoted to director of engineering and equipment sales.

Solar Aircraft Co.—France Q. Wilson was named manager of turbine and control sales.

Inland Manufacturing Div., General Motors Corp.—Joseph H. Overwein has been made director of laboratories, and William A. Frye has been named chief test engineer.

U. S. Rubber Co., Tire Div.—Walter D. Baldwin is now executive assistant to the vice-president and general manager, and Herbert D. Smith succeeds him as director of manufacturers sales. Thomas J. Newton was chosen director of private brand sales, and William F. Wrighton was named operations manager.

Electric Auto-Lite Co.—Walter F. Miller has been appointed manager of fleet sales.

Goodyear Tire and Rubber Co.—Robert E. Haverman has been appointed manager of Government sales.

Strick Trailers—Charles I. Bohlen has been appointed director of engineering.

Carborundum Co.—The following product advertising managers have been appointed: J. William Wade, Bonded Abrasives Div.; Joseph A. Mark, Coated Abrasives Div.; John M. Smith, Refractories Div.; Phillip F. Kattan, Stupakoff Div.; Donald J. Millar, Canadian Carborundum Co., Ltd.; and Carl A. Loomis, Canada Sand Papers, Ltd.

Globe Hoist Co.—Fred W. Swanson, Jr., has been elected chairman of the board.

Brush Electronics Co.—Norman R. Klivans has been made assistant general sales manager.

Chrysler Corp., Stamping Div.—Frank H. Brown has been made manager of production planning and material control.

Giddings & Lewis Machine Tool Co., Field Sales Div.—John M. Dolan has been appointed vice-president and general manager.



Pratt & Whitney Co., Inc.—Jacob J. Jaeger and Albert L. Knapp have been elected to the board of directors.

Brown & Sharpe Mfg. Co., Industrial Products Div.—Wallace E. Anderson has been appointed vice-president and general manager; William A. McGregor, manufacturing manager; Kenneth V. Gordon, director of production ordering; Harold B. Schott, general sales manager; Victor S. Lindstrom, field sales director; William T. Nystrom, director of precision tool and gage sales; Colin Sharp, supervisor of metal cutting tool sales; J. Arthur Lord, supervisor of sales for pumps; and Stuart F. Hall, supervisor of screw machine tool sales.



Bendix Products Div., Bendix Aviation Corp.—Edward E. Hupp was named assistant director of sales for automotive products.

Baldwin-Lima-Hamilton Corp.—Gerald B. Hall and Robert E. Billings are sales representatives for testing machines and SR-4 strain gages and SR-4 transducer cells and measuring equipment in the new Detroit office.

Lindberg Engineering Co.—Earl G. Olsen was made manager of the new Rochester, N. Y., office.

Pratt & Whitney Co., Inc.—Raymond A. Simmons has been made an assistant purchasing agent.

Joseph T. Ryerson & Son, Inc.—Theodore L. Kishbaugh was made assistant vice-president in the Procurement Dept.; and Wayne D. Duketts was chosen general manager of the Los Angeles plant.



Osborn Manufacturing Co., Brush Div.—Alfred J. Chandler has been appointed sales manager.

Automatic Transportation Co.—Raymond E. Orton has become manager of the Product Engineering Dept.

Mercury Div., Ford Motor Co.—R. R. Nadal has been appointed dealer affairs manager; T. J. Henry, advertising and sales promotion manager; A. H. Crowley, parts and service manager; and R. W. Chambers, market analysis and planning manager.

Delco-Remy Div., General Motors Corp.—Rine Kruger, Jr., was named assistant chief engineer for battery engineering activities.

B. F. Goodrich Aviation Products—Glenn A. Zimmerman has been appointed manager of new products sales.

American Motors Corp.—William L. Courage is now manager of the Automotive Marketing and Analysis Dept.

Chrysler Corp., Export Div.—William P. Bittenbender is now regional director of marketing operations in Europe, the Middle East, and North Africa.

Necrology

Charles E. Stone, 70, president of Interstate Drop Forge Co., died Dec. 20, at Milwaukee, Wis.

Preston Tucker, 53, promoter of the controversial car bearing his name, died Dec. 26, at Ypsilanti, Mich.

Ivan C. Dresser, 60, special assistant to the general manager of General Motors Overseas Operations Div., died Dec. 27, at New York, N. Y.

Fred K. Myers, assistant general manager of sales for Superior Steel Corp., died Dec. 22, at Carnegie, Pa.

Louis S. Clarke, 90, founder of the Autocar Co. (now a division of White Motor Co.) and automotive inventor, died Jan. 6, at Palm Beach, Fla.

Leroy J. Ackerman, 37, Eastern representative for the Lindberg-Fisher Div. of Lindberg Engineering Co., died Dec. 11, at Baltimore, Md.

Robert O. Knudson, 65, assistant sales manager for the Special Machine Tool Dept. of Greenlee Bros. & Co., died Dec. 19, at Rockford, Ill.

How can aluminum help you style and sell



THE answer is in one simple but all-important fact: Aluminum gives you a combination of useful properties *unmatched by any other metal*. This versatile metal, Kaiser Aluminum, is opening a whole new field for styling and design ingenuity.

For example, these styling trim ideas can be *practical realities* in aluminum...

Practical for forming, because aluminum lends itself ideally to virtually every fabricating process... casting, extruding, stamping, forging... etc.

Practical for finishing, because aluminum can give you flexibility of appearance... from a buffed, mirror-like finish to a luxury-look satin... using the simplest mechanical and chemical processes.

Practical for production speed and economy, because aluminum can permit savings on material, reduced tooling costs and finishing operations. And the easy handling of lightweight parts leads to further savings in fabrication and assembly.

tomorrow's car?

And — again through this unique combination of *properties* — aluminum provides extra benefits that can be used as sales advantages . . .

Lasting beauty, solid aluminum, with no plating to chip, wear or peel.

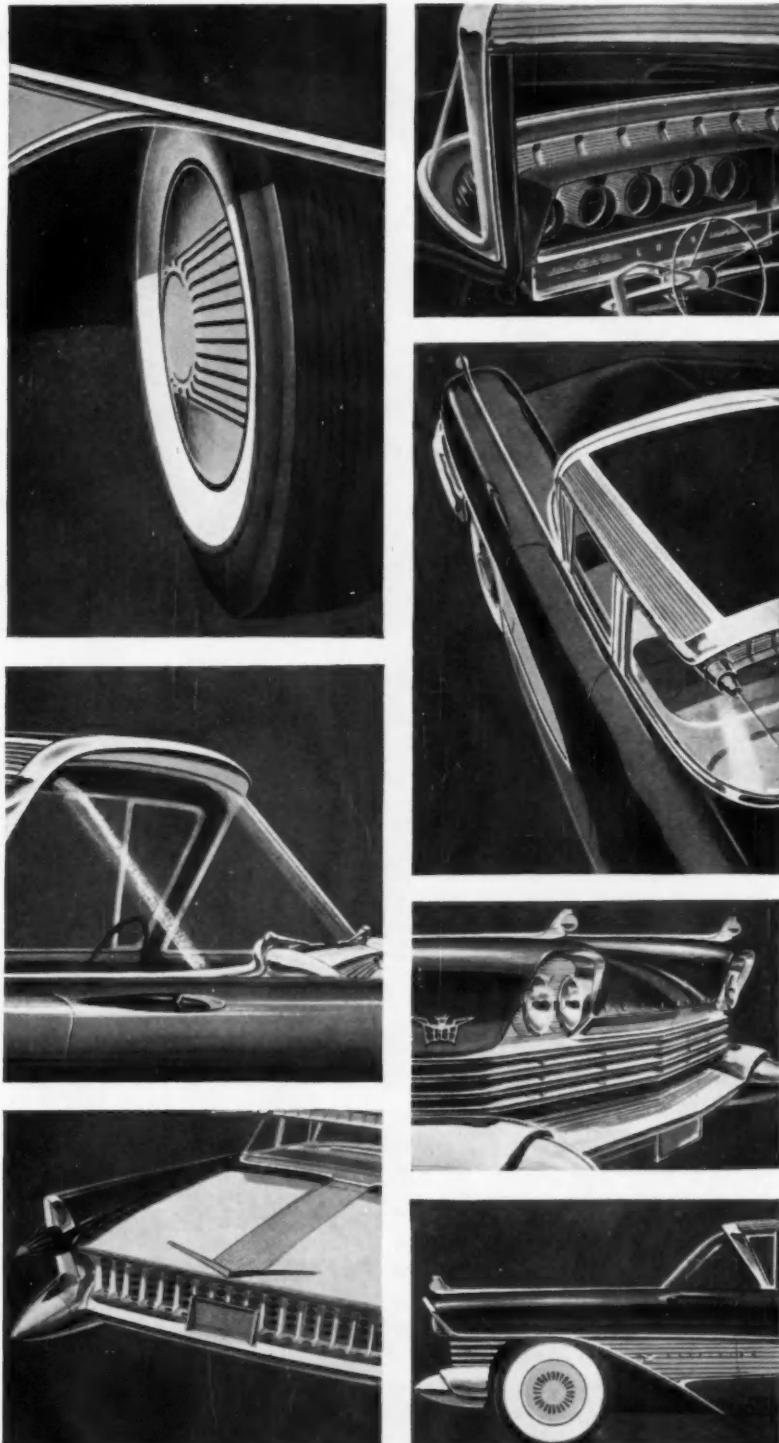
Rust-proof, corrosion resistant.

Easy to maintain, "new look" for the life of the car helps boost trade-in value and lowers reconditioning costs.

Our Automotive Development engineers are available to work with you as "idea partners" . . . introducing new developments such as Kaiser Aluminum's exclusive, *sunfast* gold-color aluminum alloy . . . as well as to help you on any specific requirements and problems in aluminum alloy selection and fabrication.

For further information, call our Automotive Industry Division, TRinity 3-8000, Detroit. Kaiser Aluminum & Chemical Sales, Inc., 2214 Fisher Bldg., Detroit 2, Michigan.

See "THE KAISER ALUMINUM HOUR." Alternate Tuesdays, NBC Network. Consult your local TV listing.



Kaiser Aluminum



PRECISION WASHERS

For automatic transmissions
and similar bearing applications

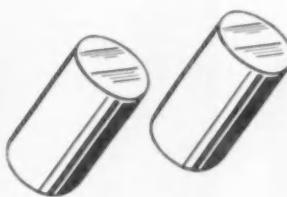
Solid steel or bronze; steel faced with babbitt or copper-lead, or copper-lead on *both* faces. Flat, spherical or special shapes. Grooves, holes, nibs, scallops or lugs. O.D. 1" to 6". Wall thickness: solid, .028" to .141"; bimetal, .034" to .141". Cold rolled for heavy-duty. Large capacity. Complete engineering service.



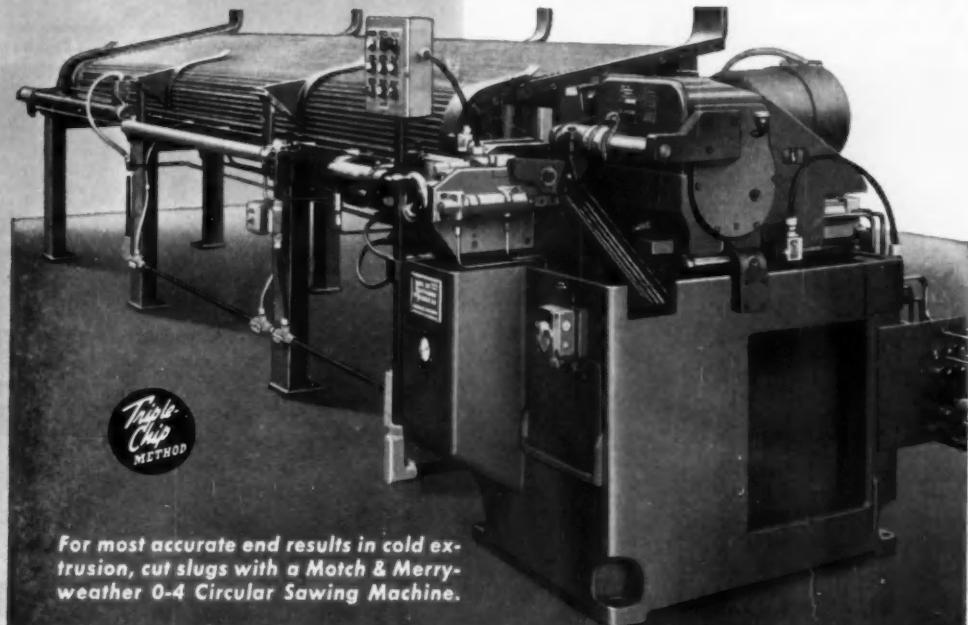
FEDERAL-MOGUL DIVISION
FEDERAL-MOGUL-BOWER BEARINGS, INC., 11037 SHOEMAKER, DETROIT 13, MICHIGAN

RESEARCH • DESIGN • METALLURGY • PRECISION MANUFACTURING

cold cuts



BY MOTCH & MERRYWEATHER



For most accurate end results in cold extrusion, cut slugs with a Motch & Merryweather 0-4 Circular Sawing Machine.

... make better COLD EXTRUDED PARTS

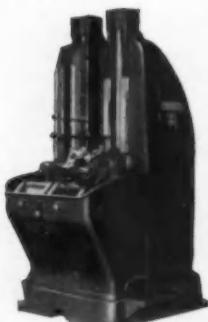
The Motch & Merryweather No. 0-4 Precision Circular Sawing Machine is automatic from the storage table to the finished cut slug. It cuts slugs accurate to $\pm .002$ " with uniformly square ends and minimum burr. Give your cold extrusion press the opportunity of producing more work than ever before, with more accuracy than ever before, at a lower cost per piece than ever before.



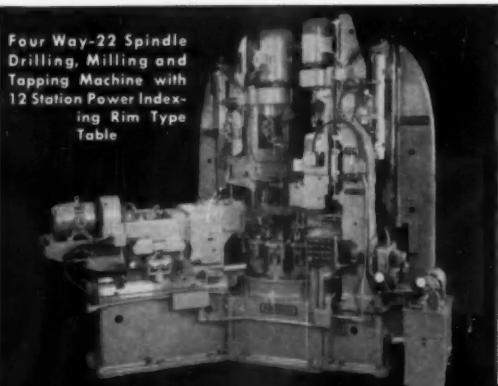
THE
MOTCH & MERRYWEATHER
MACHINERY CO.

MACHINERY MANUFACTURING DIVISION
CLEVELAND 13, OHIO

Builders of Automatic Precision Cut-Off, Milling and Special Machinery



Duplex Surface Broaching Machine
5, 10, 15 and 25 ton capacity



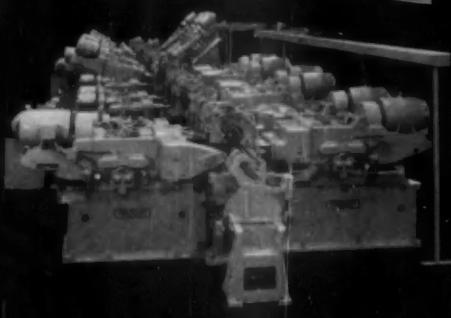
Four Way-22 Spindle
Drilling, Milling and
Tapping Machine with
12 Station Power Index-
ing Rim Type
Table



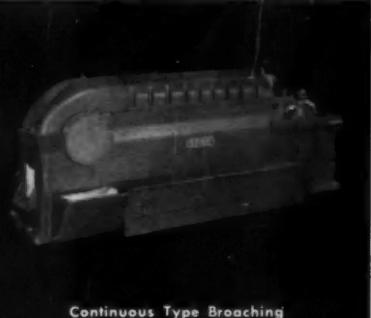
Extremely Accurate Hammond
Tool Room Grinder



Single Slide Broaching Machine
5, 10, 15 and 25 Ton capacity



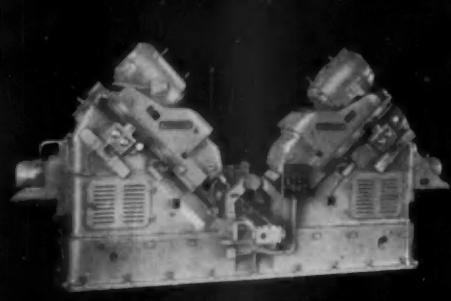
19 Station-115 Spindle
Drilling and Milling Machine



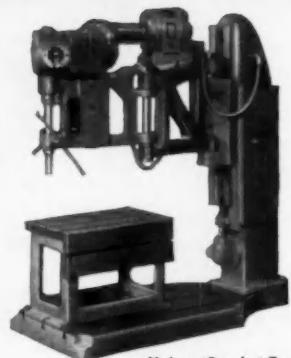
Continuous Type Broaching
Machine Built in Five Sizes



1, 2, 3, 4 and 6 Spindle
Sensitive Drilling Machines



Two-Way Hydraulic Feed
Vee Type Stub Boring Machine



Unique Bracket Type
Hammond Radial Drilling
and Tapping Machine

FOOTBURT line of production machines

• Way Type Drilling, Boring, Reaming, Tapping and Milling Machines with One, Two or More Ways . . . Station Type Machines . . . Center Column Type Machines . . . Cylinder Boring Machines . . . Inverted Drilling Machines . . . Surface Broaching Machines . . . Sensitive Drilling Machines . . . Hammond

Radial Drilling Machines . . . Hammond Surface Grinding Machines . . . Manufacturing Type High Duty Drilling Machines . . . Independent Feed Drilling Machines . . . Special Machines.

THE FOOTE-BURT COMPANY, Cleveland 8, Ohio

Detroit Office: General Motors Building

Engineered for production

F O O T B U R T
M A C H I N E T O O L S

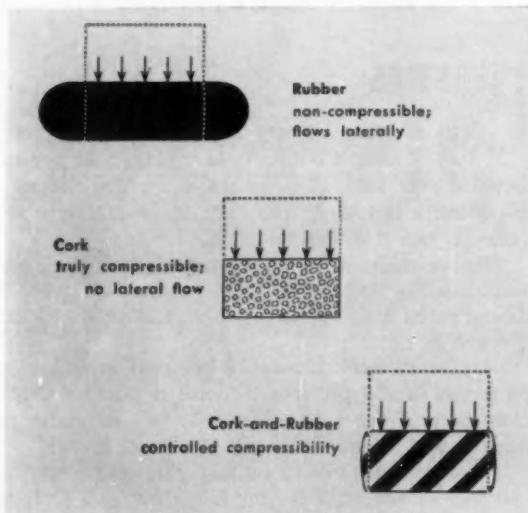
How to cut the cost of O-rings

Lathe-cut, compressible cork-and-rubber rings often can reduce your O-ring costs substantially. At the same time, they may effect savings in machining time and inventory costs. Here's why:

Molded rubber O-rings are incompressible and therefore must be made to very close tolerances to allow perfect fit between the flanges. An O-ring too small in cross-section will not seal effectively . . . and an oversize O-ring will prevent flange contact.

Cork-and-rubber compositions, on the other hand, combine the compressibility of cork with the non-compressibility of straight rubber compounds. This compressibility can be controlled and compositions produced which are nearly as compressible as cork, or almost as incompressible as rubber. The percent of compression for cork-and-rubber rings may range, therefore, from 20% to 33%.

In some applications, the wider tolerances permissible with compressible lathe-cut rings may effect savings in machining time. In other cases, it may be possible to reduce inventories because one size of



cork-and-rubber ring may work where two or more rubber O-ring sizes might otherwise be required.

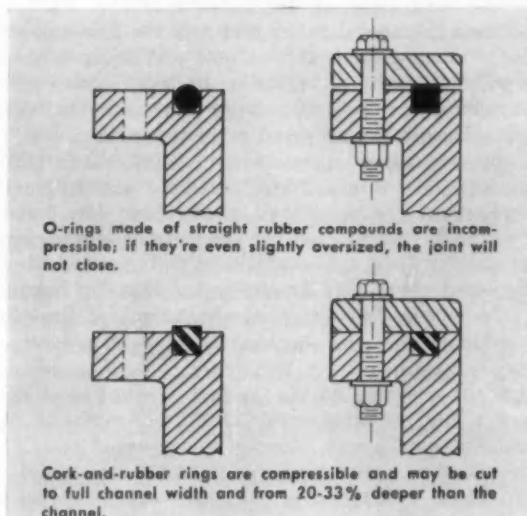
Armstrong Cork-and-Rubber Rings can be cut to fit existing channel dimensions (from $\frac{3}{8}$ " to 20" I.D.), with no change required in channel size or design.

Imperviousness

All lathe-cut Armstrong cork-and-rubber compositions are impervious. Their rubber binder encloses each cork particle in a continuous matrix. Cork-and-rubber can be used to seal high internal pressures. The upper and lower temperature limits vary with the different compositions and with the fluids to which they are exposed. In most cases, continuous operating temperatures should not exceed 300° F.

Solvent resistance

The solvent resistance of cork-and-rubber compositions is comparable to straight synthetic rubbers of corresponding base polymers. For example, cork-and-chloroprene-type synthetic rubber is normally used with lubricating oils, and for general purpose applications where some swell is desired or can be



tolerated. Cork-and-nitrile-type synthetic rubber provides good gasoline and aromatic-solvent resistance and has less tendency to swell or stick on metal surfaces. Cork-and-styrene-type synthetic rubber compounds, however, have very limited solvent resistance and should not be used for these purposes.

SEND FOR 24-PAGE GASKET MANUAL

You'll find other useful information on the design and use of gaskets in the new Armstrong Gasket Design Manual. Write for your copy to Armstrong Cork Company, Industrial Div., 7101 Imperial Ave., Lancaster, Pa. For information on all Armstrong Gasket Materials, see Sweet's product design file.



Armstrong
GASKET MATERIALS

... used wherever performance counts

STEEL

SDURING 1956, the steel industry of the United States increased its capacity to the highest level ever — 133,459,150 net tons annually — according to Benjamin F. Fairless, president, American Iron and Steel Institute.

The new annual figure represents a gain of 5,096,060 tons over the 128,363,090 net tons capacity for ingots and steel for castings reported for January 1, 1956. The American steel industry can now produce more than 40 per cent of the world's output, Mr. Fairless said.

The additional capacity will help the iron and steel industry to meet heavy current and prospective demands for new oil tankers, highway construction, freight cars, pipelines, schools and public buildings, oil wells, power plants and other projects.

The expansion will continue in 1957 and in future years as the iron and steel industry anticipates the accelerated growth of the United States, Mr. Fairless predicted. One year ago the companies announced programs for 1956, 1957 and 1958 totaling about 15 million tons of capacity for ingots and steel for castings.

To support the rise in steelmaking capacity, other producing facilities in the industry have been expanded and improved. Blast furnace capacity went up 1,332,720 net tons during the past year and as of January 1, 1957, is rated at 86,817,950 tons annually. The industry's coke oven capacity is now rated at 72,970,980 net tons a year, a gain of 1,462,580 tons over 1956. Finishing mill facilities have been expanded and improved. Much work also has been done to increase the supply of raw materials.

The new weekly steel capacity figure, on which the steel industry's weekly operating rate will be figured starting with the first announcement December 31, is 2,559,490 net tons of ingots and steel for castings, compared with 2,461,758 tons at the start of 1956.

STAINLESS STEEL

STHE stainless industry continued to produce at a near record rate during the year and is expected to ship 680,000 net tons of finished mill products for 1956, according to E. J. Hanley, president of Allegheny Ludlum Steel Corp. This is less than one per cent below the all-time record high set by the industry last year when 686,000 net tons were shipped. During the past year production and shipments were curtailed by a 34-day strike.

During the year shipments of stainless steel plate increased 58 per cent over the previous year; hot rolled bars went up 36 per cent; tubing, 29 per cent; cold rolled sheet, 10 per cent; and heat resisting stain-

INDUSTRY

Previews

less steels, 21 per cent over the 1955 figure.

There was a decrease of 22 per cent in shipments of cold rolled strip. This product made up 39 per cent of the shipments of the industry in 1955 and totaled about 31 per cent this year. Much of this product goes to the automotive industries.

While the automobile business dropped in 1956, growth in other areas of the industry offset this decline. Increases were noted in mill shipments to the aircraft industry which had a 58 per cent rise over 1955 shipments. Industrial machinery and capital equipment shipments had a 43 per cent increase and those to the electrical machinery industry rose 133 per cent.

Among development projects successfully completed in 1956 were new functional applications in automobiles. Stainless steel expander rings for automotive pistons and parts for the radiator are being used on some 1957 cars. Another new application is the stainless steel muffler for use on Diesel locomotives.

PLASTICS

PTHE plastics industry achieved a record production of over 4 billion lb last year, a 10 per cent increase over 1955, it is estimated by The Society of the Plastics Industry, Inc. Only 10 years ago production was less than one billion lb.

Total production for all plastics and synthetic resin materials for 1956 will be approximately 4,112,900,000 lb, compared with actual production in 1955 of 3,738,916,000 lb.

Last year's approximate 10 per cent growth comes on top of the 30 per cent increase in plastics production the previous year. For 1957, SPI estimates production will be approximately 5 per cent higher.

The production record set last year also established the plastics industry, for the first time, as a \$2 billion industry. The value of its products in 1956 are estimated by SPI at approximately \$2,056,450,000.00. This compares with \$1,869,458,000.00 in 1955.

More important than volume, though, according to industry leaders, is the entry into solid new markets and the growing number of structural and semi-struct-

Still Higher Production Foreseen by Suppliers to the Automotive Industries

and Reviews

tural components in building and transportation.

Particularly fertile fields for reinforced plastics in the year ahead are the whole transportation industry (including passenger cars and trucks, airplanes, boats and railcars), household appliances, furniture and seating, containers, construction and electrical components.

Production of reinforced plastics automobile bodies continues at an increased rate and tooling for the next model of the Chevrolet Corvette is now underway. The volume growth of reinforced plastics in cars, however, is in components for heater and air conditioner housings, instrument panels, fender fins, trim panels and "hardtops." This year, for example, one automobile manufacturer has tooled to produce dash panels of reinforced plastics for all his cars — a panel so designed as to fit all models. In fact, General Motors Corp., Ford Motor Co., Chrysler Corp., American Motors Corp. and Studebaker-Packard Corp. are today using reinforced plastics for some body components.

A LUMINUM

IN 1956, the aluminum industry, through its continuing program of expansion, succeeded in bringing the supply of the metal up to the level of demand. As a result, aluminum now is freely available for many new uses.

Despite losses in the second half of the year due to strikes, U. S. primary aluminum production in 1956 reached a total of about 3,365,000,000 lb, up 7.5 per cent over the record primary production in 1955. This was the fifth year in succession that the industry set a new primary production record.

Elimination of stockpile calls eased the aluminum supply situation considerably during the year. By the end of 1956 the Office of Defense Mobilization had reduced its acquisition of the metal by a total of 1,300,000,000 lb. With minimum aluminum stockpiling objectives attained, the ODM announced that there will be no stockpile call for the metal in the first half of 1957, thereby making the total supply available to industry.

Shipments of almost all classes of semi-fabricated

aluminum products were at higher levels in 1956 than in the previous year. Statistics compiled by the U. S. Bureau of the Census show an 8.1 per cent increase in total shipments of wrought products during the first nine months of the year compared with the same months of 1955. The Bureau's figures show shipments of sheet and plate up 9.4 per cent; extruded shapes up 6.2 per cent; rolled structural shapes, rod and bar up 12.3 per cent; and forgings up 8.1 per cent.

Production of aluminum ingot from scrap continued at a high level in 1956. Figures compiled by the U. S. Bureau of Mines show that production during the first half of the year was about two per cent over the same period of 1955. Since much of the secondary-ingot output goes to foundries, which are large suppliers to automobile manufacturers, the production of secondary ingot is expected to register a substantial increase once full production of 1957 models gets under way.

Primary aluminum producers increased their annual capacity by more than a quarter of a billion lb in 1956. Total capacity at year end reached 3,524,000,000 lb per year. Additional facilities now under construction will increase the industry's primary capacity by about 42 per cent during the next two years. Included are four new reduction plants; two of them are being built by new producers.

Biggest uses of aluminum in automobiles continue to be in engine parts, automatic transmissions and trim. An experimental engine with a die-cast cylinder block may be the forerunner of much greater aluminum use in automobile engines. The improved aluminum supply situation is expected to stimulate many new uses of the metal by the automobile industry.

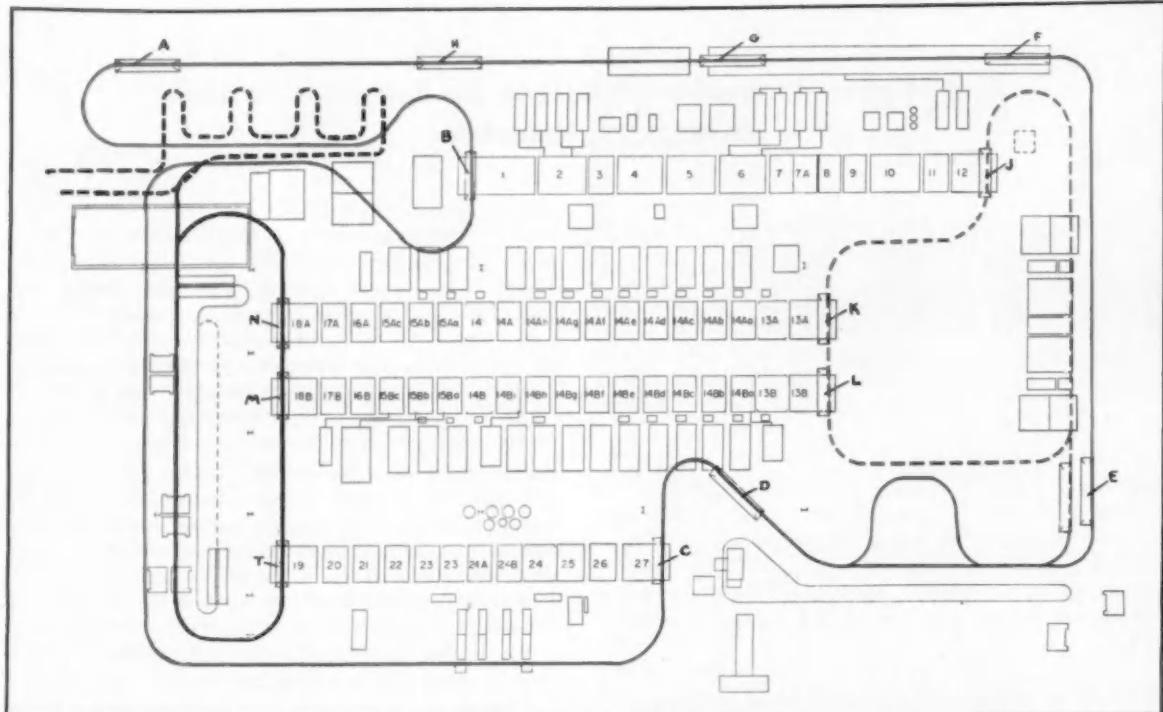
R RUBBER

CONSUMPTION of new rubber in the United States in 1956 will be the second highest on record—approximately 1,440,000 long tons, or about 90,000 tons less than the all-time peak reached in 1955, John L. Collyer, Chairman of the Board, and W. S. Richardson, president of The B. F. Goodrich Co., said in a year-end statement.

The decline in new rubber consumption during 1956 was almost entirely due to lowered requirements by the automotive industry for tires and other rubber products for use on new vehicles, according to the B. F. Goodrich officials. Replacement sales of almost all types of products manufactured by the rubber industry, however, were higher in 1956 than in the previous year.

The outlook for 1957, based on what are believed to

(Turn to page 180, please)



Plating department layout at the new Rheem plant. Three independent, automatic monorail systems transfer all bumper material between the lines of process tanks. (Solid red, dotted red, and black lines). The fourth conveyor (dotted black at left) brings polished parts to the system.

Large Germanium Rectifiers *used in* New Plating Facility

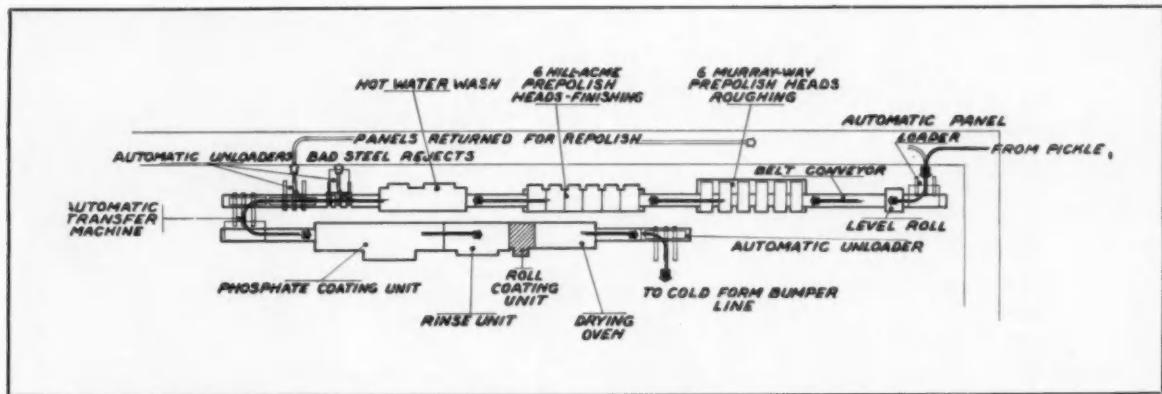
KEY TO STATION AND PROCESS SHOWN ABOVE				
1.	Soak	Clean	14A.	Drain &
2.	Cathodic			Transfer
3.	Clean		15Aa.-15Ac.	Bright Nickel
4.	Cold Rinse &		16A.	Recovery
5.	Spray			Rinse
6.	Anodic Acid		17A.	Rinse &
7.	Cold Rinse &		18A.	Spray
8.	Anodic Clean		19.	Hot Rinse
9.	Cold Rinse &			Load & Soak
10.	Spray			Clean
11.	Drain &		20.	Cathodic
12.	Transfer		21.	Clean
13A.	Acid Dip			Rinse &
13A.	Cold Rinse &		22.	Spray
14A.-14i.	Spray		23.	Acid Dip
	Nickel Strike			Rinse &
	Rinse		24A.-24B.	Spray
	Acid Rinse		25.	Drain &
	Acid Rinse			Transfer
	Drain &			Chrome Plate
	Transfer			Recovery
	Nickel Semi			Rinse
	Bright		26.	Rinse &
			27.	Spray
				Hot. Rinse

ONE of the most outstanding bumper plating facilities, using germanium rectifiers for the first time, has been installed by Rheem Automotive, a division of Rheem Mfg. Co. It put in a total of four automatic lines, covering 45,000 sq ft in its Fullerton, Calif., plant, to have the largest plating facility in the West.

Automation and continuous production flow equipment is utilized as much as possible. Through the new setup, bumper production has jumped about 1250 units per day over the old plant.

Bumpers are produced of conventional bumper stock —hot-rolled, low-alloy, high-tensile steel, with two bumpers being knocked out of each piece of sheet. Initially, sheet stock is pickled and then automatically conveyed to a level roll machine and finally through a 12-stage continuous flat bed polishing operation. Each panel is visibly and instrumentally inspected and segregated into acceptable, rerun or scrap categories.

Acceptable panels are carried on to a transfer unit where they are moved on for Bonderizing, rinsing, coating with drawing compound, and baking. All of



Pre-polish, wash, phosphate coat, and dry bumper panel unit.

the foregoing operations are carried out automatically.

A series of 1900-ton, double-action presses perform the required forming operations without using automated handling devices. A close tab is kept on all tooling to prevent impact marks or scratches on the bumpers' outside face. Following the forming, bumpers once again go on an automatic cycle through a series of polishing machines.

Pre-Plating

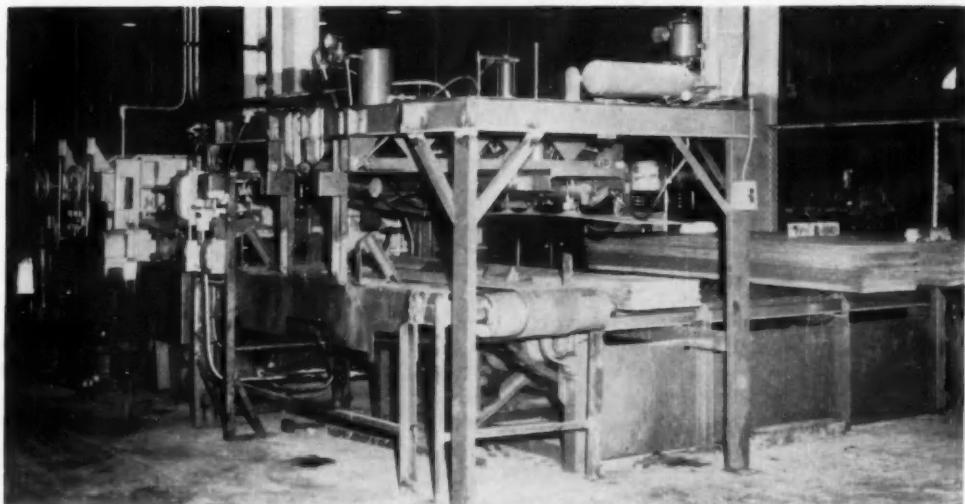
At the plating department 10 to 16 bumpers are manually placed on racks—at floor level—for the required series of operations. The plating machinery was designed to give the plant a maximum amount of flexibility. It was built by Udylite Corp. and L. H. Butcher Co. (Udylite's west coast subsidiary) to give completely automatic cleaning, pickling, nickel strike and pre-plate operations combined with monotractor fed, cell-type, nickel and chrome plating tanks. The

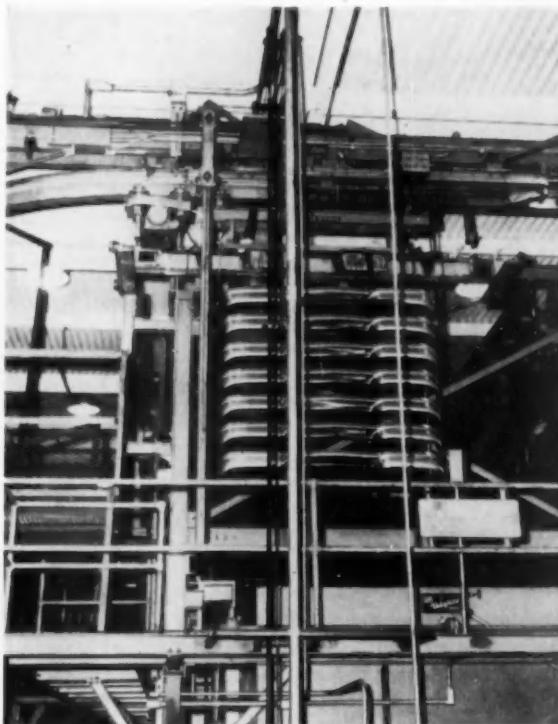
entire operation is controlled from a master control board through an electrical relay and inter-lock system.

Each automatic pre-plate machine is a straight line unit measuring 133 ft long by 15 ft wide and 22 ft high. Plating racks carrying the bumpers are mounted on work carriers which move automatically to the pre-plate machine by a monorail system. Hydraulically operated pushers move the carriers in one direction only through the machine. The limited stroke of the pusher bars prevents the carrier from over-travel.

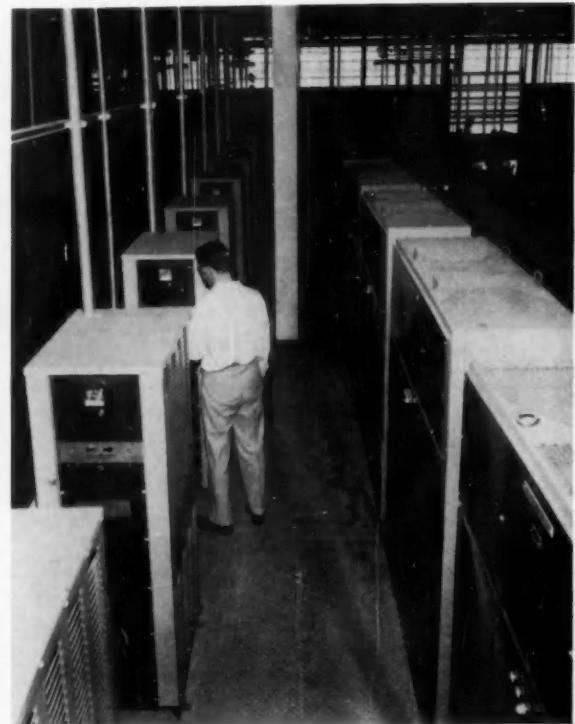
The overhead monorail system servicing the plating department has a large outer loop circling the entire operation and two inner loops connecting the four processing lines. Monotractors used on the plating line automatically return to the starting point at approximately two-hour intervals. These tractors move along at 50 fpm. Additional monorail loops are provided in the system for inspection and storage of

Automatic, vacuum type loader places sheets of bumper steel on belt conveyor that feeds level roller prior to passing through 12 flat polishing machines.





Bumpers are removed from end of cleaner line and are conveyed automatically to the first station in the nickel plating line.



Line of 5000 amp, 18 v germanium rectifiers for the nickel strike line. The units are equipped with Inductrol automatic voltage regulators.

bumpers on monotractors prior to nickel plating.

Bumpers are cycled through 13 operations in the automatic pre-plate machine. This machine is identified by numbers 1 to 12 on the accompanying station and process illustration.

Nickel Plating

When work carriers leave the pre-plate, they are picked up automatically and delivered selectively to either of the two semi-automatic nickel plating lines. Work carriers are dropped off and then mechanically pushed forward to a manual pick-up station. Monorail hoists, manually controlled, pick up the carriers and place them in the nickel plating tanks for the predetermined time cycle.

The nickel line consists of two sections, each composed of 16 tanks. Twelve of the tanks contain nickel plating solutions. Each tank has conforming anodes and cathode bar agitation and contains 3750 gal of solution continuously heated and filtered.

Each of the nickel tanks is powered by a 5000 amp, 18 v General Electric germanium rectifier with automatic stabilized voltage control. Each rectifier is housed in 5000 amp cubicles, with most of them mounted on the mezzanine floor over the nickel tanks. A cubicle contains three blowers, five power trays and five transformers. The germanium cells are hermetically sealed from the plating room atmosphere because of its corrosive properties. Rectifiers have a

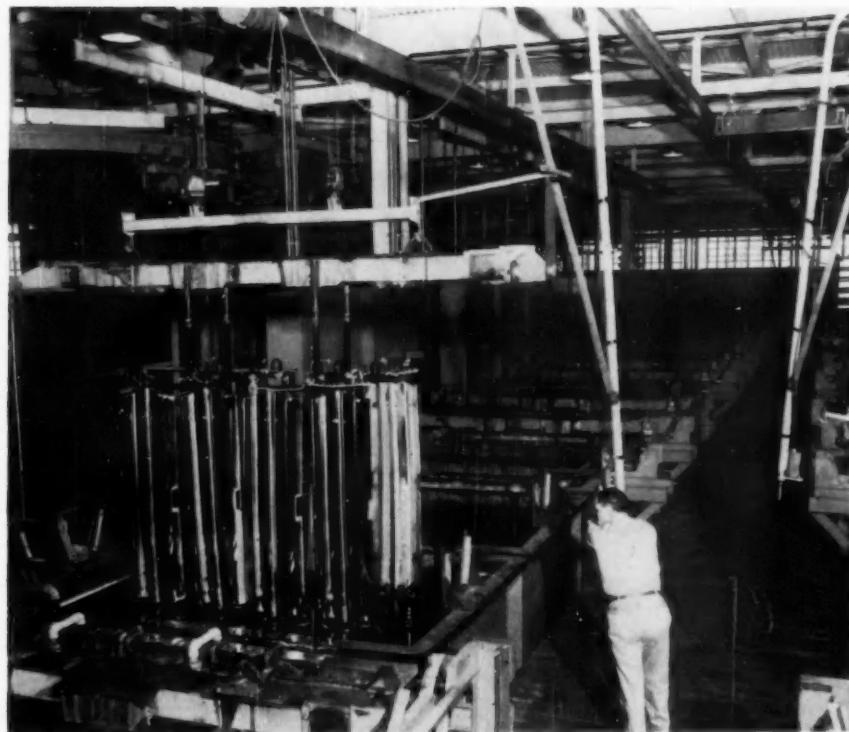
full load efficiency as high as 85 per cent. The power germanium cell is made from a 0.020 in. thick slice of a highly purified single crystal of germanium. Metal disks are soldered to each side of the slice, using indium as a constituent of the solder on one side only. The indium alloys with some of the germanium create a junction within the slice and a barrier layer across which current flows far more freely in one direction than the other. When properly cooled, this rectifier can be used at current densities almost 1000 times higher than selenium and will withstand a much higher inverse voltage per cell than selenium or copper oxide.

Chromium Plating

After bumpers leave the nickel strike and bright nickel lines, they are transferred to inspection stations. The work carrier is then conveyed to the chromium line and handled by a manually controlled monorail system through a series of 10 cleaning, rinsing, and chromium plating tanks. The two chromium tanks have a capacity of 3750 gal each, with each tank powered by a 20,000 amp, 15 v germanium rectifier.

Inspection—Palletizing

Work carriers, following the final bumper plating, are automatically picked up and delivered to an unloading area where the plated bumpers are removed for inspection and palletizing. Plating racks and work carriers are next processed on the monorail system



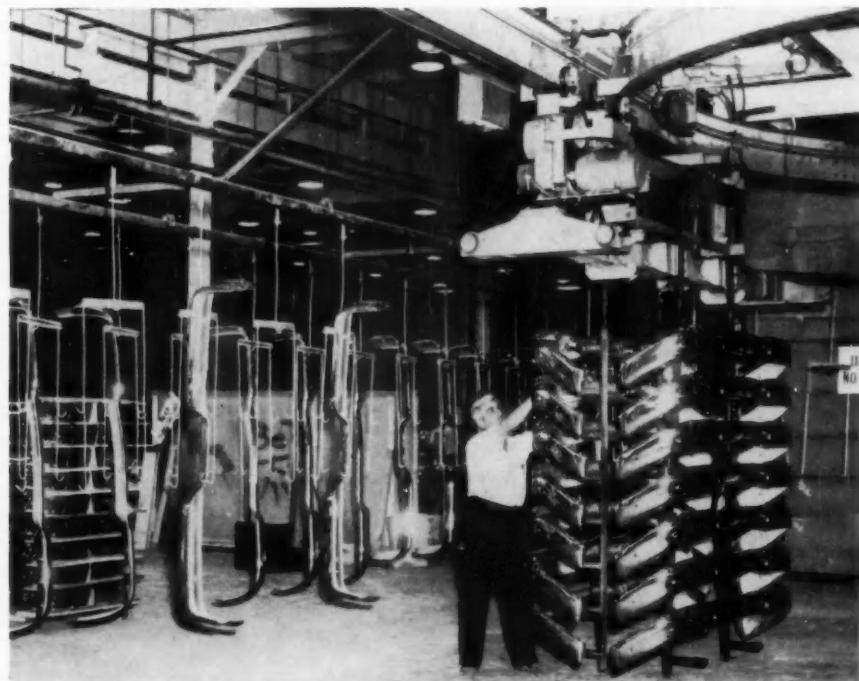
The chromium plating line is fed by manually controlled hoists. Cycle time is automatically controlled.

through an electrolytic rack strip tank containing 31,000 gal of solution.

Koroseal, Plastisol or Neoprene tank linings are used wherever acid or other corrosive conditions are en-

countered. Giant fans and water-wash fume exhausters are used around all processing tanks. Solutions are heated by steam from two cross-drum type boilers of 500 hp capacity.

Bumpers are automatically delivered to station where they are inspected prior to being transferred to paint spray conveyor and palletizing for shipment.



AUTOMOTIVE FORECAST for 1957

By Leonard Westrate

WITH a rueful backward glance at predictions that went awry last year, the automobile industry is looking ahead to 1957 with a much more cautious optimism. Even with the encouraging reception given 1957 models in the last two months of 1956, experienced automotive men know that an initial sales spurt can be unreliable and feel that it will be at least mid-February before they can assay accurately prospects for the year.

An objective appraisal shows that 1956 was a good year for the automobile industry. Admittedly it did not come close to the spectacular performance of 1955 which was an unusual year by any standard. When 1956 is compared with other postwar years, however, it measures up very well, with production of automobiles the fourth best on record and retail sales the third best. Incidentally, it was only the second time in history that sales outran production, the only previous year being in 1954.

At the outset of 1956, market analysts and automobile company officials were predicting production and sale of about 6.8 to 7.2 million cars for the year. The optimism was not totally unwarranted in the light of sales rates of late 1955 and early 1956, but by the end of the first quarter it was apparent that the forecasters were shooting far over the mark. There is no apparent explanation for the slackening of sales just at the time when the market normally turns up, but as a result production for the year fell below even the most conservative estimates made last January.

New car production for 1956 is estimated at about 5.81 million, or approximately 26.8 per cent under the 7.939 million turned out in record 1955. In addition to

Optimistic Forecasts of 10 Per Cent Increase in Passenger Car Production Are Based on World Peace and a Continuing Higher Level of National Prosperity

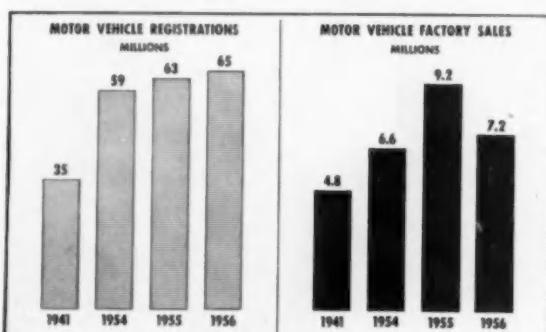
1955, the only other years having greater production than 1956 were 1950 with 6.66 million, and 1953 with 6.11 million.

Production of trucks last year is estimated at 1.11 million compared with 1.24 million in 1955, a drop of less than 11 per cent. Actually, truck production was higher every year since 1947 than it was last year, with the exception of 1954, but the 1956 performance is not as discouraging as those figures would indicate. The reason is that the margin between 1956 production and output in several other years when it was greater, is only a very narrow one percentagewise.

Preliminary estimates of how the industry fared in various categories last year show factory sales of automobiles, trucks, and buses totaled 6.925 million units, including 5.81 million cars and 1.115 million trucks and coaches. This is 23.9 per cent under the 9.1 million vehicles produced in record 1955. While complete new automobile registration figures will not be available for several weeks, it is estimated they will approximate 6 million, which would be surpassed by only two previous years—1950, with sales of 6.326 million, and 1955 with 7.169 million.

In many other respects, 1956 was a record year in its own right. Motor vehicle registrations soared to an estimated 65,275,000, some 2.4 million above the record set in 1955. Passenger car registrations of 54,300,000 and motor truck and bus registrations of 10,975,000 were both records.

Records were set in gasoline consumption, vehicle miles traveled, vehicle taxes collected and highway expenditures. Exports of trucks and buses, though not a new record, totaled 210,000 compared with 192,696



PRELIMINARY "AUTOMOBILE FACTS AND FIGURES"—1956

in 1955. Gasoline consumption climbed to 49.5 billion gallons from 47.7 billion; vehicle miles traveled rose to 605 billion from 583 billion. Total special taxes on motor vehicles rose to \$7.6 billion, with trucks alone paying \$2.1 billion of the total tax bill. The capital outlay for all roads and streets in 1956 is estimated at a record \$5.5 billion, with maintenance, administration and interest charges of \$2.7 billion bringing the total to \$8.2 billion.

The wholesale value of car, truck and bus sales reflected the decline in production, but remained high at \$11.15 billion, compared with \$14.47 billion in 1955 and \$9.87 billion in 1954. For passenger cars, the figure is estimated at \$9.3 billion, and for trucks and buses, at \$1.8 billion. The dip in wholesale value of 1955 replacement part and accessory sales, on the other hand, was not as sharp, totaling \$1.75 billion against \$1.8 billion in the preceding year.

Automobile industry employment in 1956, including both salaried personnel and production workers, averaged 800,000 but was climbing at the end of the year as production on 1957 models got into full swing. This compares with a total employment of 896,500 in 1955. The annual payroll for production workers alone totaled \$3.08 billion, compared with \$3.76 in the preceding year.

Expenditures by motor vehicle and parts manufacturers for plant expansion and new equipment last year were at a record high of \$1.86 billion. AMA estimates that in the past 10 years the automobile industry has spent just short of \$9.7 billion on plant expansion and equipment, showing a steady rise of from \$349 million in 1949 to \$1.86 billion in 1956.

Probably one of the most significant developments of 1957 was the involvement of the automobile industry with the Government and the significant changes in dealer relations that resulted from the Congressional hearings.

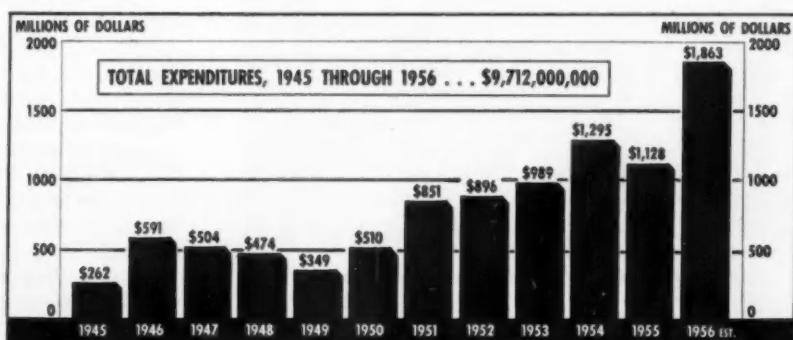
General Motors was under the heaviest fire and pioneered significant changes in dealer franchises that are both costly and far reaching. These included full recovery to the dealer of labor on warranty work, much more favorable termination provisions, options on tenure of the contract ranging from one to five

	1954	1955	1956	
Factory Sales—Number				
Passenger Cars.....	5,558,897	7,926,186	5,850,000	
Trucks and Buses.....	1,042,174	1,249,090	1,115,000	
Total.....	6,601,071	9,185,276	6,965,000	
Factory Sales—Wholesale Value				
Passenger Cars.....	\$8,218,004,000	\$12,482,871,000	\$ 9,300,000,000	
Trucks and Buses.....	1,660,019,000	2,020,973,000	1,850,000,000	
Total.....	9,878,113,000	\$14,473,844,000	\$11,150,000,000	
Exports—Number of Vehicles				
Passenger Cars.....	208,544	254,337	200,000	
Trucks and Buses.....	194,916	192,696	210,000	
Total.....	401,460	447,033	410,000	
Replacement Parts and Accessories, Domestic Market, Wholesale Value.....	\$1,653,000,000	\$1,805,000,000	\$1,750,000,000	
Gasoline Consumption—Gallons	44,365,000,000	47,731,000,000	49,500,000,000	
Vehicle Miles of Travel.....	560,857,000,000	583,000,000,000	605,000,000,000	
Employment in Motor Vehicle Manufacturing				
Production Workers.....	824,400	740,400	640,000	
All Employees, Including Salaried.....	775,600	896,500	800,000	
Annual Payroll in Motor Vehicle Manufacturing				
Production Workers.....	\$2,887,000,000	\$3,765,000,000	\$3,085,449,000	
Special Taxes on Motor Vehicles				
All Vehicles.....	\$8,303,517,000	\$7,296,329,000	\$7,600,000,000	
Motor Trucks.....	\$1,765,779,000	\$1,935,751,000	\$2,100,000,000	
Highway Expenditures—All Roads and Streets				
Capital Outlay.....	\$4,050,000,000	\$4,862,000,000	\$5,513,000,000	
Maintenance, Administration and Interest.....	2,447,000,000	2,592,000,000	2,707,000,000	
Total.....	6,498,000,000	\$7,454,000,000	\$8,220,000,000	
Motor Vehicle Registrations, Dec. 31st (Including Publicly Owned)				
	Passenger Cars	Trucks	Buses	Total
1952.....	43,817,580	9,243,264	240,485	53,301,329
1953.....	46,460,094	9,608,936	244,251	56,313,281
1954.....	48,498,870	9,848,718	248,346	58,595,934
1955.....	52,173,234	10,365,266	255,249	62,793,749
1956 (Preliminary).....	54,300,000	10,975,000	265,000	65,275,000

years, a more liberal policy on parts return, liberalizing the allowance on cars remaining in stock on new model day to five per cent on all cars from three per cent on a limited number previously, elimination of the dealer cooperative advertising charge, and other modifications favorable to dealers.

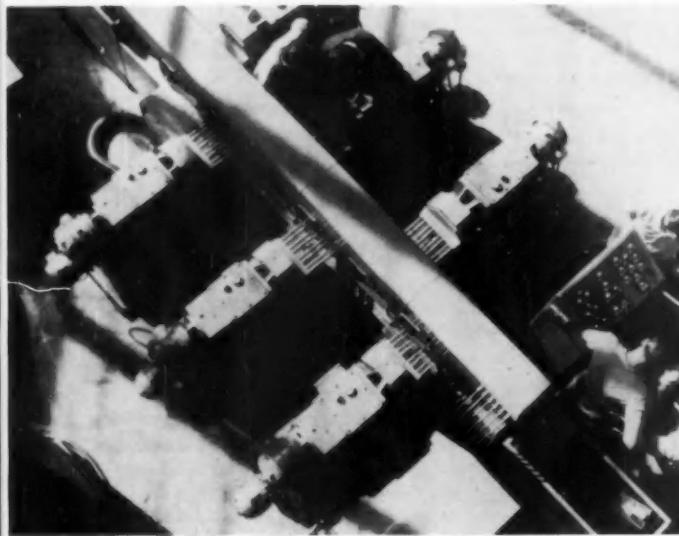
All other manufacturers have followed the GM lead on the 100 per cent warranty labor recovery. Ford

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Charts and Tables
courtesy of
AUTOMOBILE MANUFACTURERS' ASSOCIATION

Czechoslovak Motor Industry



Six-station automatic transfer line installed at Mlada Boleslav has 48 spindles for machining the valve seats and guide holes on aluminum cylinder heads. Later it will be extended to cover all operations on this part.

CZECHOSLOVAKIA'S long-established vehicle industry has expanded considerably in recent years, but production is still small due to bottlenecks caused by uneven growth of manufacturing sections within individual factories. Because of this there is a good deal of unused capacity, and the present output of passenger cars is at an annual rate of only 20,000. Current planning calls for filling the gaps, however, and car production is scheduled to reach 55,000 units by 1960, and 100,000 before 1965. Annual truck output is now about 12,000, and the 1960 target is 15,000.

Of the four main motor factories in Czechoslovakia, the Skoda plant at Mlada Boleslav is the only one making passenger cars. Tatra at Koprivnice concentrates on heavy Diesel-engined trucks, and medium trucks are made at the Praga works in Prague and at Skoda in Mnichovo Hradiste. The last-mentioned is supplied by nearby factories at Hanychov for engines and at Rynovice for bus bodies. During a recent visit the writer was able to see the two largest plants in the country, and thereby gain a brief inside view of the Czech industry.

Remotely situated in northern Moravia, 165 miles east of Prague, Tatra started as a carriage works over 100 years ago. It began making motor cars in

Production Methods Aimed at Matching Increased Schedules

By
David Scott

1896, was the first automobile factory in the old Austro-Hungarian Empire, and since then has played a major role in the early development of such design conceptions as single backbone chassis, swing axle suspension, and aircooled engines. Today about 7000 workers are employed, nearly half of them women.

Recently manufacture of light cars has been concentrated at Skoda, and Tatra is currently making the Model 111 10-ton six-by-six, the 2½-ton military-type T805, and a very limited number of hand-built T603 sedans. General impressions were that while these vehicles are well designed from the standpoint of production as well as performance, the existing production facilities are as yet inadequate for taking full advantage of the economies offered.

One example of this gap between conception and execution is the Diesel engine crankshafts, which are composed of identical single-throw sections bolted together. This construction requires only simple steel castings, facilitates assembly of the roller main bearings, and permits several standard sections to be built up into multi-throw crankshafts for engines of different sizes. But although a large number of these single-throw units are needed, few special machines have been developed to make them economically, and their labor content is obviously high. Even the initial location of the two center holes in the casting for subsequent machining is done by hand on a simple measuring block, one operator taking three minutes for each unit.

Assembly operations, however, are more advanced. The big 904 cu in. V-12 engines are cradled in dollies moved along the line by drag chain. Each tows its own multi-tiered parts carrier with fitted trays holding complete sets of components. Axle sub-assemblies for the 10-ton six-by-six are transported on similar dollies. In this case costs are reduced by the fact that the three differentials are identical, as are all the swing axles.

These units are unusual, for, instead of using universal joints, each opposing half shaft terminates in a ring gear which engages one of the pinions extend-

The Tatra 141 prime mover has a 100-ton tractive effort. All wheels are driven, and are independently suspended on half-axes.



ing from its respective differential. Center lines of the axles are slightly offset to compensate for the width of the pinion, and the housings are retained by arcuate collars which permit wide angular movement. Engineers at Tatra maintained that the cost of making these additional bevel gears was justified on a truck of this weight and power, in view of the reliability of the system and its constant-velocity characteristics. After completion, axle units are motor-driven on the assembly line for noise testing and final adjustment. They are then bolted together and to the central tubular backbone to form the chassis.

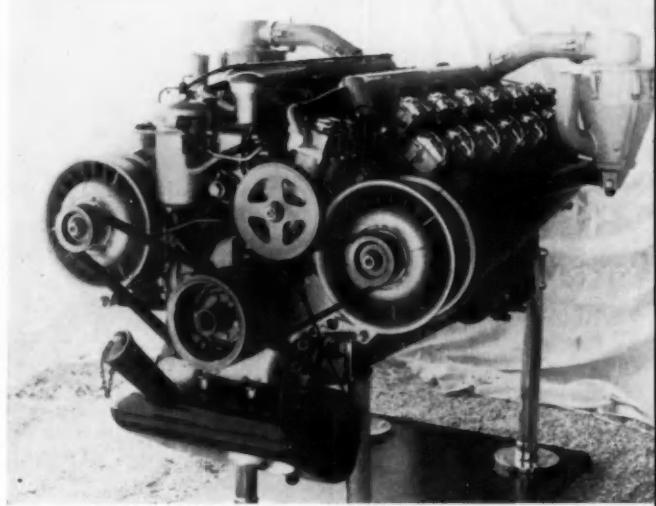
The factory makes a high proportion of its components locally, including all forgings and iron and steel castings, so the efforts of the relatively small labor force are spread over a wide variety of activities. Thus there are attempts to save man-hours by using home-built machines of minimal capital cost.

One of these is a series of drum indexing fixtures for rapid drilling of the rivet holes in brake linings. The brake shoe line, in fact, incorporates considerable mechanical handling equipment, where the different work stations are linked by monorail conveyors. The body welding bays have also been modernized by a number of power-operated jigs with air clamping.

While Tatra has been somewhat neglected as regards major investment, expansion is proceeding slowly and some efficient equipment is being installed, such as the completely new heat treatment shop where 100 ovens are regulated from a central control room.

On the other hand, production of the rear-engined T603 sedan is admittedly an uneconomic proposition. These are built in very limited numbers (70 this year) purely for prestige purposes, and are intended mainly for use by government and diplomatic officials. The big six-passenger body-frame of unitary construction is entirely hand-made at great expense, while the traditional Tatra engine-differential-gearbox combination (similar to but antedating the Volkswagen) incorporates swing axles driven through bevel gearing as on the 10-ton truck. On the car this

(Turn to page 134, please)



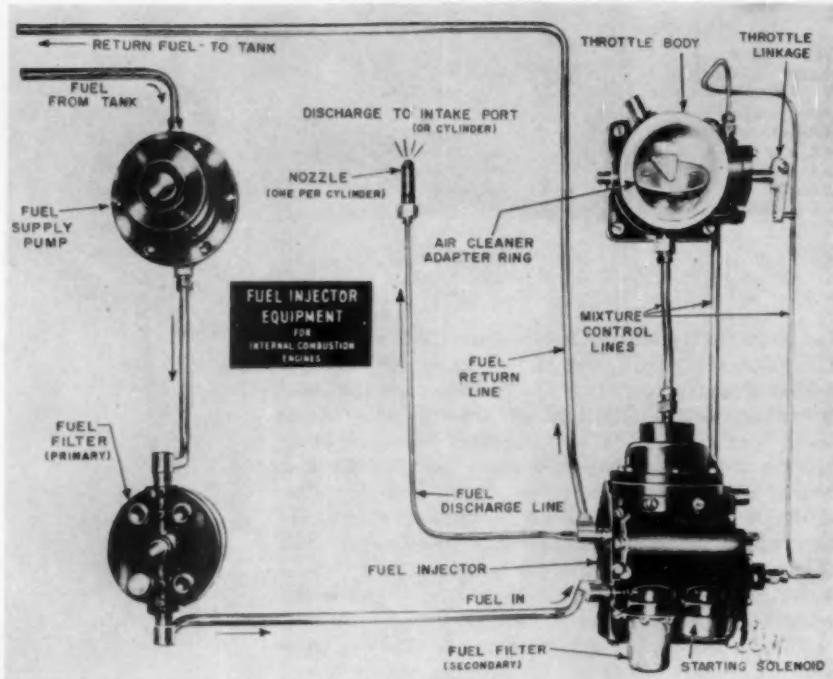
Made at the Tatra plant in Koprivnice, this V-12 aircooled Diesel has 904 cu in. displacement and develops 180 hp at 1800 rpm.



Axles of the Tatra 10-ton truck on assembly dollies. The ring gears on the inner end of each half axle engage separate pinions driven from the differential which will be bolted to the forward mounting flange.

The Marvel-Schebler Fuel Injection System

Components of the Marvel-Schebler fuel injection system



MORE detailed information about the Marvel-Schebler fuel-injection system, announced by the Marvel-Schebler Products Div. of Borg-Warner Corp., several months ago, was released recently by that Corporation.

Major elements of the system are shown in the illustrations. The fuel pump supplies gasoline from the tank, through a primary filter, to the fuel injector. Engine speed is controlled by an air throttle on the intake manifold which is connected to the fuel injector assembly by three mixture control lines.

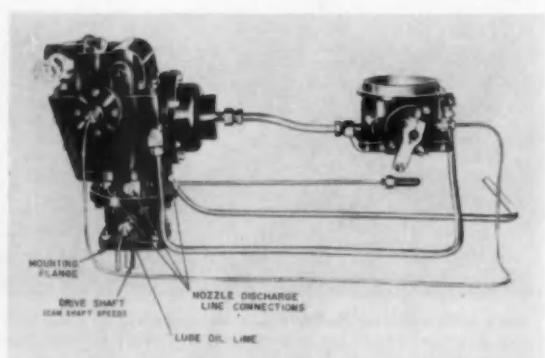
The single-plunger injection pump is driven from the engine camshaft, and supplies gasoline to each individual cylinder during its intake stroke accord-

ing to the firing order. A cam actuates the plunger, and by using a 4, 6, or 8-lobe cam the unit is adaptable to 4, 6, or 8 cylinder engines. Distribution of metered fuel is accomplished by plunger rotation with the discharge port in the plunger registering with a port in the plunger body as the plunger moves up on the cam lobe. On the down stroke of the plunger, inlet ports to the plunger pumping chamber align with ports in the plunger body leading to the fuel reservoir, so that the plunger chamber is filled on this stroke. Angular position of the fuel metering valve in relation to the plunger controls the amount of fuel delivered. Manifold vacuum regulates positioning of the valve.

A cam, actuated by a bellows which is controlled by manifold vacuum, rotates the fuel valve which matches delivery of gasoline to engine requirements. Compensation for speed, temperature, and atmospheric pressure is made by bellows and aneroids which control a movable track which supports the cam.

Additional fuel during acceleration is provided by an arresting device which will temporarily change the cam track position. A richer mixture is supplied during warm-up; and a starting solenoid supplies

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Fuel injector and throttle assemblies

AIRCRAFT INDUSTRY *Looks Forward*

to Another Year of

EXPANSION

ONE of the outstanding events of 1956 was the establishment of a new U. S. speed record of 1015 mph by a standard production Navy fighter. Even more spectacular, however, was the unofficial speed mark of more than 2000 mph and unofficial altitude record of more than 20 miles set by a rocket-powered, manned research aircraft.

In the guided missile field, Admiral DeWitt Ramsey, president, Aircraft Industries Association, reports that the Navy ended 1956 with operational models in every category. Included were a ship-to-surface missile launched from patrol aircraft and two types of air-to-air missiles. Army operational models included three surface-to-surface ballistic missiles with relatively short ranges, and a surface-to-air missile for defense against attacking aircraft. The Air Force continued to use an air-to-air missile launched from its high-speed interceptors, and a surface-to-surface missile for tactical operations.

Production of the medium jet bomber for the Strategic Air Command has been virtually completed and activation of several jet bomber wings is already under way. During the year, the Navy and Air Force both took delivery of large numbers of supersonic jet fighter type aircraft, and production was begun on a light-weight fighter capable of attaining speeds more than twice that of sound.

Not yet in production, but nearing the end of the research and development cycle as the year came to an end, were hypersonic intercontinental and intermediate range surface-to-surface missiles and various missiles in other categories. Research simultaneously continued on new aircraft types, including chemical and nuclear powered bombers, anti-gravitational devices, earth satellite vehicles and many other projects once considered fantastic.

Advances in commercial aviation paralleled those on the military side. For the second year in a row U. S. and foreign air carriers placed orders and took options for more than \$1 billion worth of jet and turboprop transports with American manufacturers. Backlog of orders in all types of commercial transports (piston, turbojet, turboprop) stood at \$2,796,000,000 at the end of the third quarter of 1956 and

was expected to near the \$3 billion mark by the end of the year. The number of utility aircraft sold for business, survey, transportation and agricultural purposes continued to increase.

Review of 1956

During the year just ended, the activities of the nation's aircraft industry remained fairly stable. While the number of military planes produced continued to decline (as had been anticipated when the Joint Chiefs of Staff set airpower goals in 1953), the 1956 sales volume of firms making aircraft, engines, propellers, and parts is estimated at more than \$8.6 billion compared with \$8.5 in 1955.

The 12 largest airframe manufacturing companies recorded sales of approximately \$5,250,000,000 in 1956 compared with 1955 sales of \$5,188,000,000. The 1956 figure represents a new peacetime sales high, but company earnings and the ratio of profits to sales are expected to decline somewhat from 1955 levels. During the year, the nation's aircraft industry invested heavily in new facilities, especially those devoted to research and development. With the relatively stable production level in existence for the past several years, aircraft manufacturers have been able to concentrate on improving manufacturing techniques and on cost reduction programs, thereby providing the U. S. government with "more air power per dollar." This steady level of production has also resulted in the establishment of a substantial mobilization base, which can be quickly expanded in case of emergency.

Prospects for 1957

Within the next 12 months according to Admiral DeWitt C. Ramsey, president, Aircraft Industries Association, America's aircraft industry will have met the national air power goals set by the present Administration late in 1953. By July 1, 1957, the U. S. Air

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The first station starts with an empty platform. Note the arrangement of casters which carry the platform in a giant oval, guided by the floor track and side-mounted casters.

Truck Body Assembled on Merry-Go-Round Setup

By
WALTER RUDOLPH

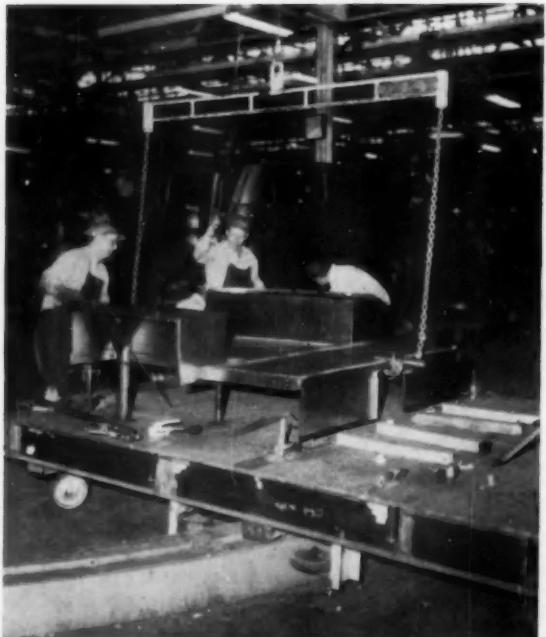
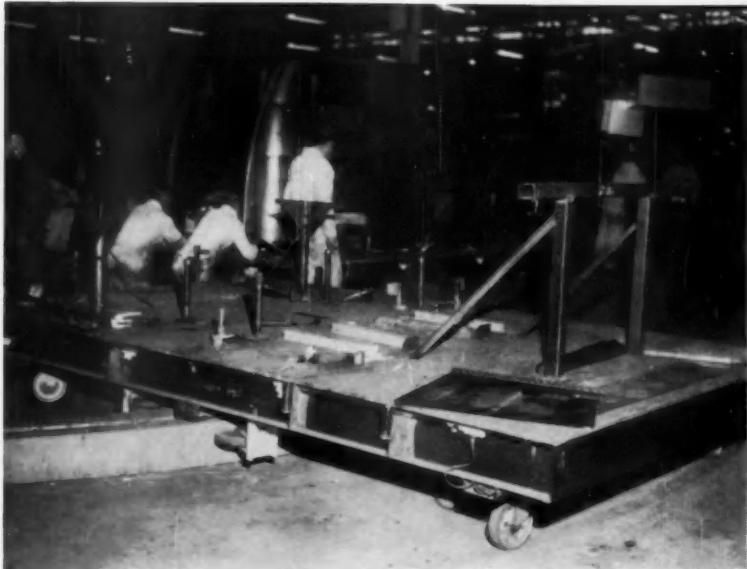
Feeding the merry-go-round, and adjacent thereto, is a sub-assembly area where 20 and 22-gage steel panels and parts are fabricated by welding while being positioned in precision fixtures. Sub-assembly, in turn, gets its material from stock piles built up

TWIN Coach Company, Kent, Ohio, is currently turning out 24 "Pony Express" trucks during an eight-hour shift, using a relatively small group of workers in conjunction with efficient tooling and production planning.

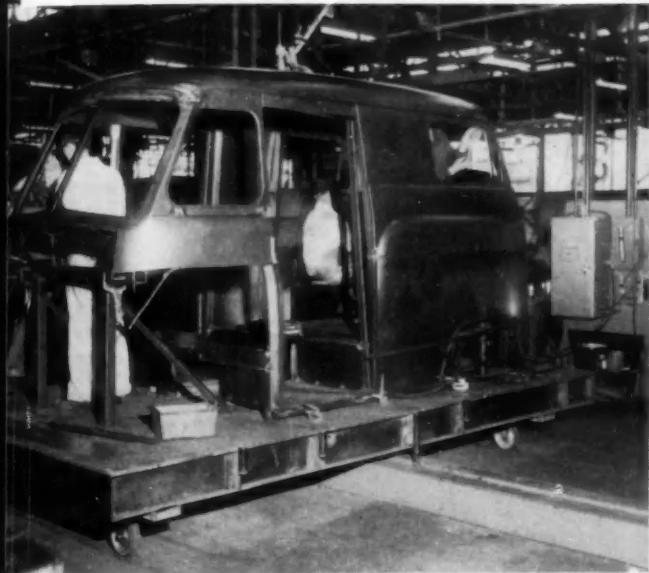
The Pony Express was developed to meet the need for a compact, versatile and rugged vehicle that could be widely used in commercial multi-stop operations. At present a large order for the United States Post Office Department is rolling from the plant.

The truck bodies are completely fabricated, assembled and painted by Twin Coach, being mounted on chassis furnished by Dodge. Highlights of the merry-go-round body assembly operation, key feature of the production layout at the Kent plant, are outlined in the following, which is supplemented by the accompanying illustrations.

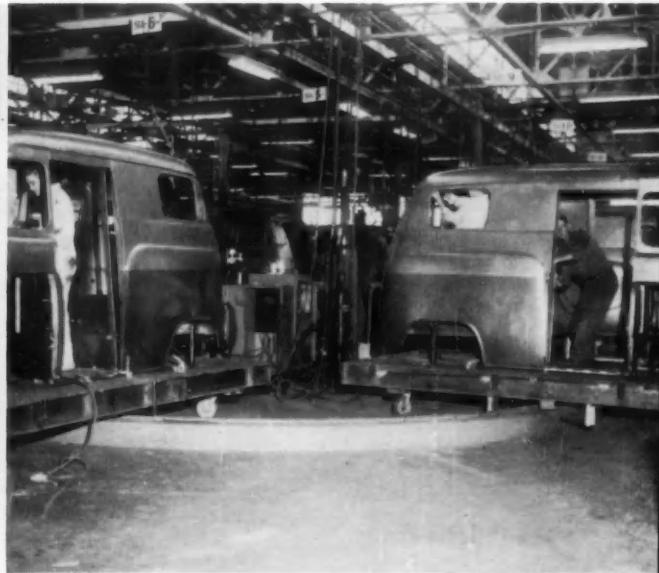
The merry-go-round, or "wheel" as it is sometimes called, operates on a 20-minute cycle with 12 work stations. Assembly work is done on a series of movable platforms which roll around the "wheel" on casters. Movement of the platforms from station to station, timed at periodic intervals, is by means of a sub-floor power unit which is geared for a slow pull of covered linkage between the platforms. The platforms are guided by a floor track which is laid out in the form of an oval about 30 by 124 ft.



This shows the "wheel" receiving its first sub-assembly, the cargo floor of the Pony Express. Speed is the key factor from here on, where most of the body joining is accomplished by welding.



Assembly welding being performed at station 5. Seen at the right is part of the bank of controls dispersed throughout the center area of the "wheel" to provide accessibility for the welding operations.



Quarter-view of the opposite end of the "wheel" from station 1, with 7 at the left and the platform's next stop, 8, to the right. Something like 10 minutes have passed since the body assembly began at station 1 and already the Pony Express begins to take on a finished look.

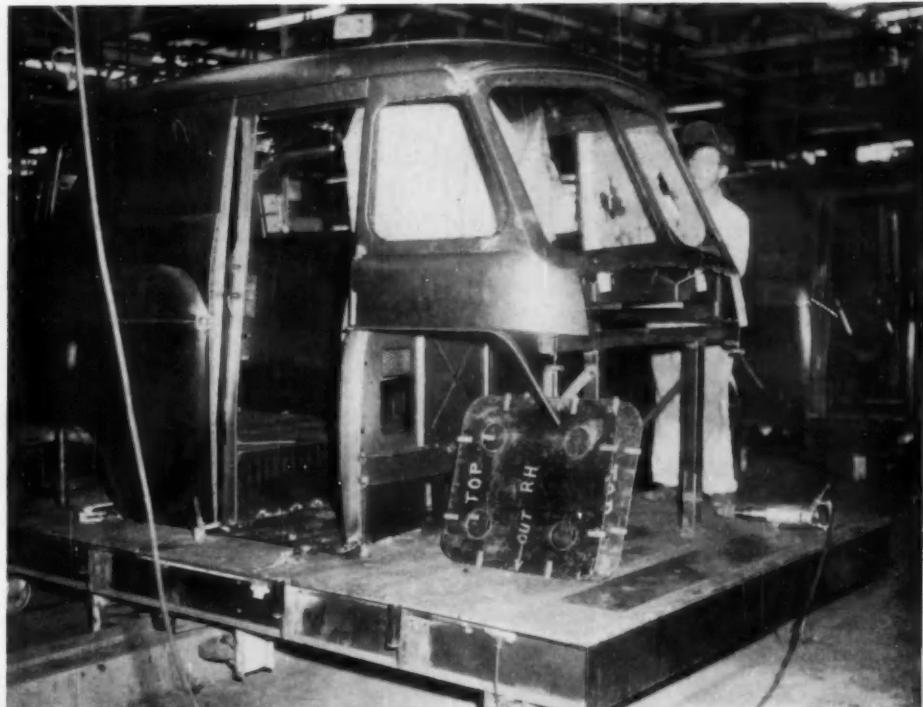
by the press department in quantity to forestall any hold-up of the closely-knit production schedule.

The first sub-assembly received by the "wheel" is the cargo floor of the Pony Express. From here on three types of welding—spot, arc and acetylene—do most of the body joining. A bank of controls runs through the entire center area of the "wheel" to simplify accessibility for the welding operations. Locating fixtures are profusely used, as many pieces are added and holes must be accurately located and

drilled in order to more easily facilitate assembly.

Even as early in the cycle as station 3 the body begins to take shape, since at this point the operations include position and line-up of front end, spot-weld metal to door posts; attach roof panel assembly; and acetylene-weld body corner assemblies. Progressively, through succeeding stations, additional assembly welding is performed, along with other work such as drilling and tapping.

(Turn to page 130, please)



Shown here is the body at station 10. The templates are for left and right quarter window openings, which are finish ground to size at this location.

New Press and Welding Setups

DAGENHAM, ENGLAND

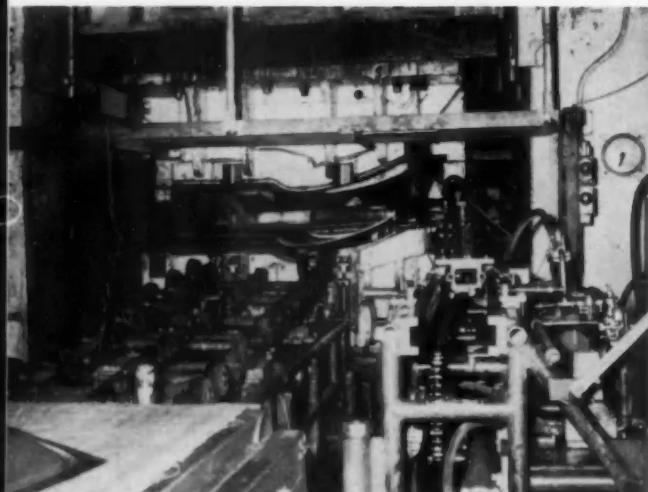
As part of its \$180 million expansion scheme, British Ford is modernizing the Dagenham plant of Briggs Motor Bodies, a wholly-owned subsidiary. New press and welding equipment has been installed for the Mark II Consul, Zephyr and Zodiac bodies which provides the optimum degree of mechanization for the present combined output of 500 cars a day of these three models.

The aim is continuous production and uninterrupted material flow, with transfer equipment between machines in order to avoid accumulations of stampings on the floor and to reduce manual handling. For this purpose the press shop is extensively equipped with remote loaders and mechanical extractors, turnover devices and conveyors.

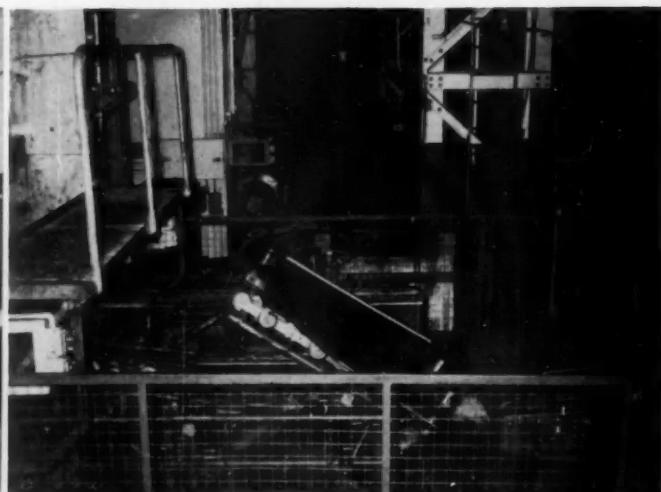
The loaders and extractors reduce press cycle times, since panels can be simultaneously withdrawn and inserted as soon as the die opens and during the upstroke of the ram. All loaders are of standard construction with the same basic drive and sharing a number of interchangeable parts. Mounted on a carriage of adjustable heights, they consist of a motor geared to the belt conveyor, and incorporate an



At the first 1050-ton press in the door outer panel line a remote loader carries the blank onto the lower die as the ram starts its upstroke.



The door outer panel, pneumatically lifted from the first press as soon as the die opens, is pulled onto the turnover section of the exit rollers by an air-operated extractor (right) whose stroke is doubled by a chain drive.



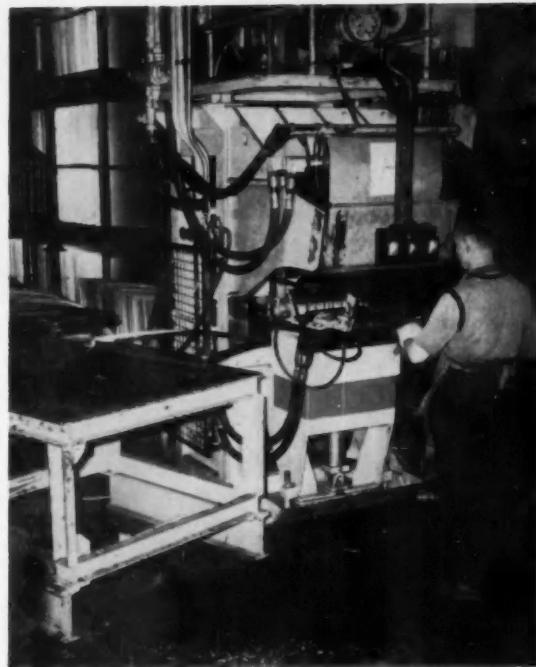
The turnover section of roller track following the first press on the door outer panel line drops the inverted stamping on the belt conveyor leading to the trim press which shears the edges and cuts out the window.

at Briggs Plant in England

By
David Scott



Angled conveyors carry the door outer panels from the flanging press to the overhead conveyor.



Door outer panels are sub-assembled with internal reinforcements on this C-frame hydraulic welding press.

electric clutch-brake for quick stop-start control.

Most extractors use a 30-in. pneumatic cylinder as a prime mover. These are novel in that they contain an extended air cushion at the end of each stroke instead of the more complex system of retarding valves. Gripping jaws are faced with short lengths of heavy-duty V-belt which are claimed to have a long life, averaging 7000 draws per pair.

Extractors are adjustable for height and tilt, and are carried on floor-mounted supports. These assemblies vary according to application, and the side arm and half bridge types have sliding carriages driven by the cylinder through a chain and pinion or multiplying lever to double the stroke of the ram.

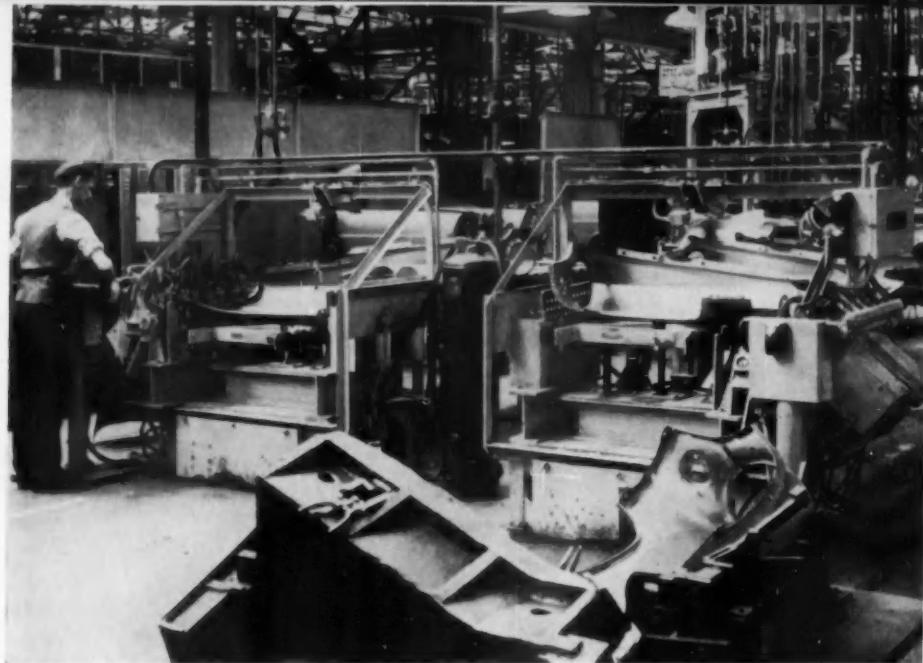
Full bridge units, of similar construction, are designed for large components such as hood and trunk lid panels. A pair of jaws grip the work at each corner to provide a central pull without obstructing the outward conveyor. For panels such as the roof and front floor pan a motor driven side arm extractor with a total stroke of 84 in. is employed.

Turnover devices at the unload side of presses are

of both power-driven and gravity types. Belt conveyors linking the operations are from 12 to 24 ft long and up to 5 ft wide. They run at a uniform speed of 50 fpm, and some have an automatic stop to cut the motor when a panel reaches the end of the belt. A further detail of mechanical handling is the pneumatic or spring lifter within the die which elevates the stamping during the ram upstroke. In some instances there is a pneumatic kicker which makes an extractor unnecessary.

One of the three new press lines already in operation is for the outer door panel. Sheared blanks are fed manually into the remote loader which carries them into the 1050-ton British Clearing double-action machine. Two push buttons depressed by the operator simultaneously start the loader and the press, and the extractor jaw moves in to $\frac{1}{2}$ in. from the die.

At the beginning of the ram upstroke pneumatic lifters dislodge the stamping and the extractor snatches it out, dropping it on the turnover section of the initial gravity conveyor when the retracting carriage trips a limit switch. A 12-ft belt conveyor



This two-position machine welds the clinched flange to the reinforcement on right and left front fenders. Mechanical actions are pneumatic, and interlocking pushbutton controls isolate one unit while the other is firing.

then carries the inverted panel to the load station of the next press, where it is manually placed in the trim die.

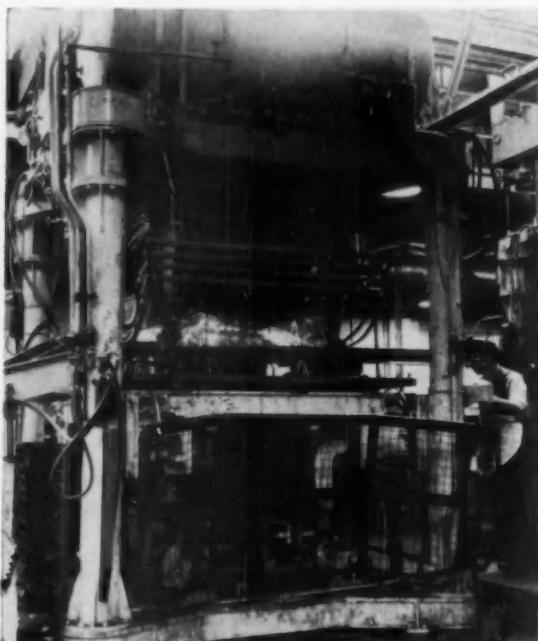
Again it is lifted on the upstroke and extracted by a jaw which deposits it on a 17½-ft conveyor leading to the flanging press. Finally it is loaded on an overhead conveyor which converges with the output from the line making inner door panels. This set-up is capable of making 420 panels per hour, production being limited by maximum toggle speed. Scrap from

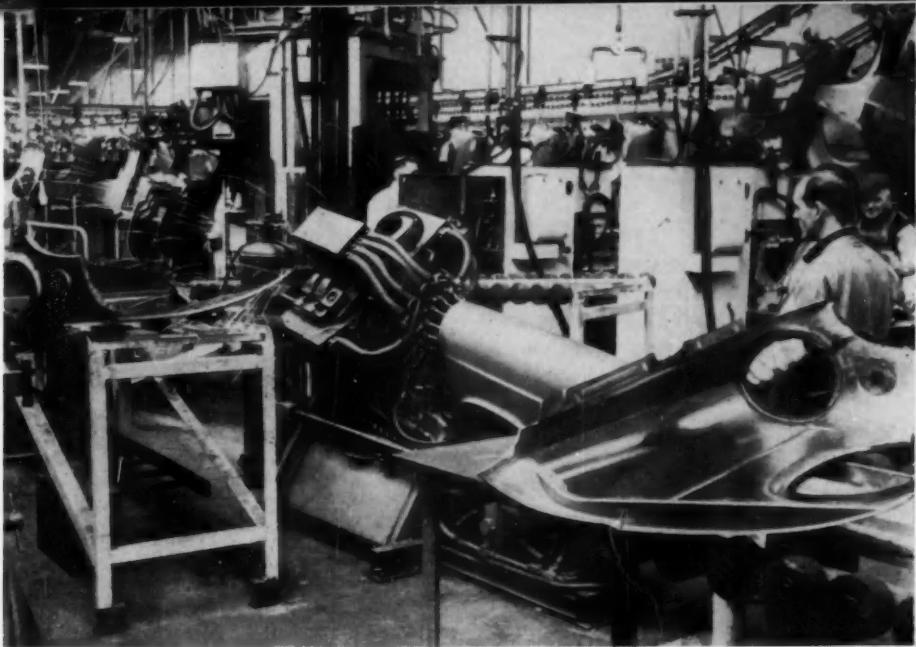
the presses drops through gravity chutes into individual dollies in the basement below. Press cycling is timed to an accuracy of 0.1 second by a rotary cam box driven by each machine.

There are now three parallel lines of this type, making hoods in addition to door panels. Briggs normally operates on a 30-day stock cycle, with dies for right- and left-hand door pressings and different hood sizes changed at 6-week intervals. Twelve similar set-ups are planned for the fenders, roof and

Sub-assembly of door inner panels is completed on this second of two 80 by 80 hydraulic welders. The elevating table is counter-balanced by an overhead air cylinder.

After flange clinching, assembled doors are roller-conveyed to the final machine which welds the clinched edges with minimum defacing of the outer skin. Welding heads securing the glass run channel are floating units which find their own level.





Headlight reinforcement rings on the fenders are accurately aligned on this multi-head welder. The machine takes both right- and left-hand pressings.

other sheet metal components of this general type.

Standardization has also been applied in the welding section. The extensive new installation comprises only three different types of presses, two types of transformers, two sizes each of hydraulic and pneumatic welding heads, two varieties of control panels, and a single type of power cubicle.

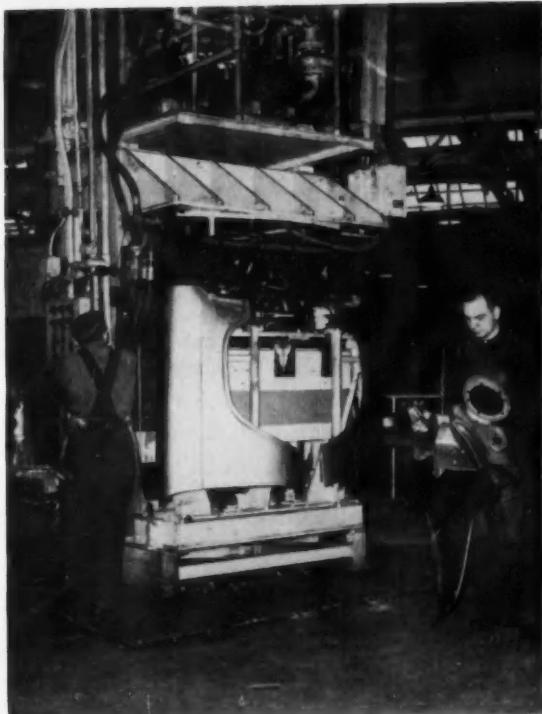
The assembly line for front fenders is typical of the use of multiple welding equipment for accuracy, quality and accessibility rather than high production. These one-piece units, originating in the press section as wrapped cones, are first hydraulically clinched over the edge reinforcement strip. Wrapped joints are then series welded on the inside on multi-head jigs with insulated bottom electrodes to minimize the amount of metal finishing needed on the outer surface.

To insure flatness for correct alignment of sealed beam headlights, reinforcements in the fender noses are welded at a 2-in. pitch around the opening on a pneumatic press which takes both left- and right-hand units.

Air duct assemblies are welded to a pair of left and right front fenders simultaneously on a C-frame press. Fenders are manually located on the vertical work table which is hydraulically raised and locked in the operating position. Welding pressure on the multiple heads is also obtained from the hydraulic system.

While the maximum output of these three machines is 50 pieces per hour, the new welding line for completed doors is required to turn out 200 units an hour and is therefore more highly mechanized. Here six machines are linked by conveyor and all are designed for changing from one door to another in a few hours by means of quickly replaceable tool assemblies and special power connectors.

Belt rail reinforcements to the outer door panels are



Air ducts are welded to right and left front fenders on this two-position press. After loading, the fixture is raised and locked hydraulically.

welded on a single C-frame press which hydraulically raises the stamping to the line of electrodes. Meanwhile, inner panels are sub-assembled on a pair of welding presses, the first of which attaches the door pillar reinforcement, glass run channel, belt reinforcement and trim card retainer. The second one handles the arm rest support, screw tapping plate and two glass run brackets. (Turn to page 112, please)

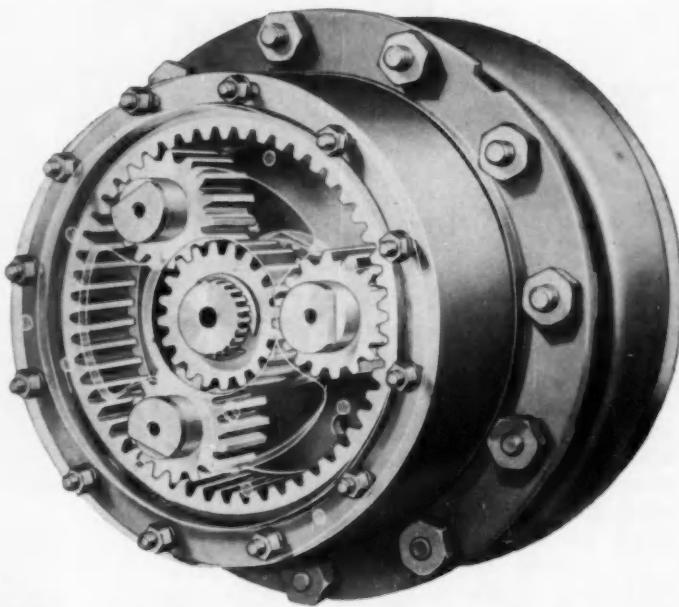
Timken-Detroit

To meet the anticipated demand for heavy duty construction equipment, particularly vehicles for off-highway and other operations that require extremely low gear reduction, Timken-Detroit is in the process of expanding its line of planetary axles. Of advanced design, these axles are available in sizes ranging from 11,000-lb to 75,000-lb capacity and, where required, in matched pairs of rigid and steering type.

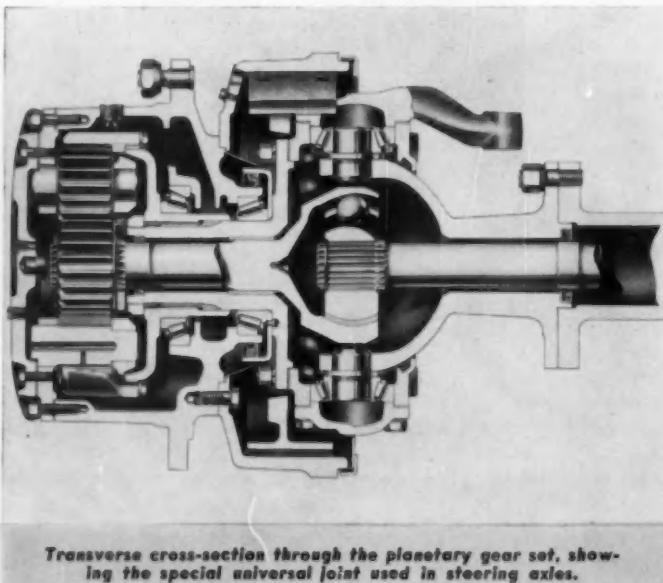
At the present writing T-D lists the following sizes: PS Series (steering axles)—PS-90 (11,000 lb), PS-100, PS-200, PS-300, PS-400, PS-500 (50,000 lb). PR Series, rigid axles—PR-100, PR-200, PR-300, and PR-700 (75,000 lb).

T-D planetary axles are in use in a variety of equipment, including: heavy duty prime movers, rugged four-wheel tractors, heavy off-highway rock wagons, mining equipment, road scrapers, front-end loaders, agricultural equipment, etc.

All of these axles have rectangular section housings, Torsion-Flow axle shafts, and Hypoid first reduction gears. The highest numerical gear reduction is placed in the planetary gear sets located in the wheels, where utilization of mechanical advantage is at the maximum. This relieves the main carrier and axle



Perspective of typical planetary gear set. The three forged bronze pinion pins seen here show the machined flat on the outer end for locking when the cover is assembled.



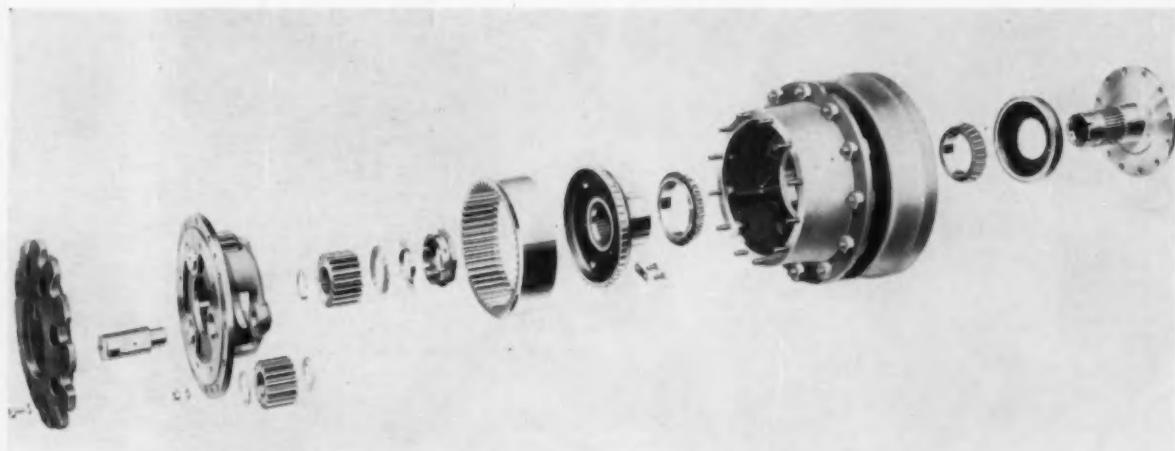
Transverse cross-section through the planetary gear set, showing the special universal joint used in steering axles.

shafts from most of the torsional loading, resulting in long, trouble-free service.

The accompanying illustrations show the typical design of the planetary gear set as well as the arrangement of the steering axle. Among the special features of the planetary gear sets are: A floating type ring gear, a concentrically mounted ring gear hub, full flow lubrication, and special forged bronze planet pinion gears. Another important feature is the high degree of interchangeability of planetary gear sets; the basic sets are the same in all respects for both the rigid and steering axles of the same series.

The ring gear and hub of this design are made in two separate pieces. The ring gear, which is splined to the hub and is free to float radially, transfers only torsional loading. Combined with the floating sun gear this feature as-

Expands Planetary Axle Line



Exploded view of parts of typical planetary gear set assembly.

sures equal distribution of loads to all of the planetary gears.

Mounting surfaces of the ring gear hub and spindle are concentrically ground to assure perfect alignment and fit. This results in the elimination of bending forces on the hub and spindle splines so that the only function of the splines is to absorb torsional loading.

Representative of the specifications for the various axles are the following data for the PS-100, PS-200, PR-100, and PR-200. Note table at right:

	PR-100	PS-100	PR-200	PS-200
Filar ratios	16.65, 19.03, 21.00 22.20, 24.48, 25.92		16.65, 19.03, 22.20 24.60, 25.92, 28.08	
Track	74½ x 75		76 x 76½	
Brakes	Hydraulic 15 x 3½ "DH"		Hydraulic 16½ x 5 "DH"	
Weight	1080 lb.	1214 lb.	1615 lb.	1890 lb.

Shipbuilding & Dry Dock Corp., and S. Morgan Smith Co. to convert the ship from a slow 10-knot Liberty to a speedy, 18-knot, gas-turbine-powered vessel at a total cost of about \$3.5 million.

Of this total, \$2.45 million was paid to Newport News Shipbuilding & Dry Dock Corp. for the actual conversion and for lengthening the bow by 25 ft; \$811,428 to General Electric Co. for supplying the gas turbine engine, and \$118,200 to S. Morgan Smith Co. for supplying a controllable and reversible pitch propeller system.

When equipped with a gas turbine engine of the type now in use in the John Sergeant, a Liberty ship is

capable of exerting 6000 hp. This compares with only 2500 hp maximum output in a Liberty ship powered by a conventional reciprocating steam engine.

The gas turbine engine consists of only three basic components: compressor, combustion system, and the turbines. Air is compressed and is directed to the combustion chambers, where fuel is injected. The heated gas leaving the combustion chamber is passed through the turbines to develop the useful power. Exhaust leaving the gas turbine passes through the regenerator mounted over the reduction gear and then on up to a waste-heat boiler.

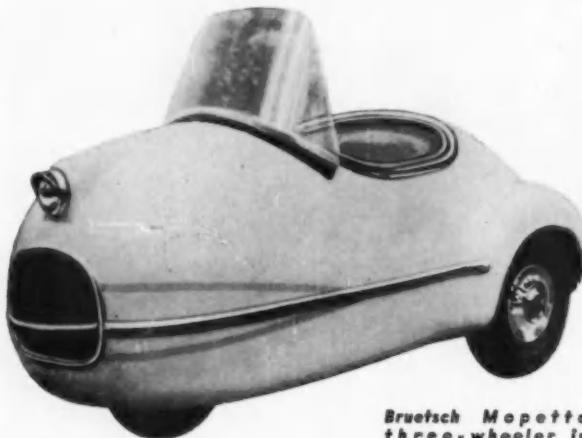
Gas Turbine Engine Chalks Up Fine Success in Liberty Ship

The first application of a gas turbine engine in a large merchant ship has proven successful in recent sea trials. As a result, the Federal Government is considering a broad program of modernizing at least a portion of its reserve merchant fleet by the installation of modern gas turbine engines.

To determine the feasibility of installing and operating gas turbine engines in merchant ships, the U. S. Maritime Administration removed from storage last year the Liberty ship, *John Sergeant*. It signed up General Electric Co., Newport News

Minicars . . .

Replace Motorcycles in Germany



*Brütsch Mopetta
three-wheeler is
smallest of all Minicars, can proceed in
water.*

By Robert Braunschweig

DESPITE numerous attempts no one had ever succeeded in making the ultra-small automobile an industrial proposition, but in Germany the Minicar or the Rollermobil, as it is called, is being produced in increasing numbers. Threatened with a rapidly shrinking motorcycle and scooter market, several motorcycle firms have taken up the production of ultra-small motor vehicles filling the gap between the smallest real automobiles, such as the Volkswagen and the Lloyd, and the two-wheelers, whose lack of weather protection is one of the main reasons of their diminishing sales. Whereas two years ago the average monthly production of all minicars did not reach 800 units, it had reached some weeks ago an all-time peak 10 times as high. Foremost are BMW-Isetta with about 200 and Goggomobil with approximately 180 vehicles daily. After the recent Frankfort motorcycle show, where



*New Goggomobil
de luxe coupe is
best looking minicar, has electrical preselective
transmission.*

minicars formed the most interesting exhibits, both these firms as well as Heinkel and Maico were able to step up their production schedule.

Most ultra-small cars now have four wheels. The three-wheeled Fuldamobil is made in limited quantities only, and the Messerschmidt autoscoter has gone out of production in favor of airplane parts. All factories have just brought out their 1957 models which incorporate many refinements. Engine capacity and performance are on the increase, as it is now agreed that even these small vehicles should be able to follow the general speed of the traffic stream. Maximum speeds vary between 50 and 65 mph.

Among the new developments are the commercial body types, such as a delivery van by Goggomobil with a payload of about 500 lb or detachable body parts which allow the BMW-Isetta to be transformed into a pick-up truck or a diminutive town delivery vehicle. The Goggomobil commercial vehicle and a new coupe are fitted with the Selectromat preselective transmission by Getrag. In this unit, two hollow and parallel shafts carry the gears for all four speeds. Gears are always in mesh



Doors swing upwards in 300 SL fashion in new coupe top for Spatz sports three-seater (Photo by Woerner)



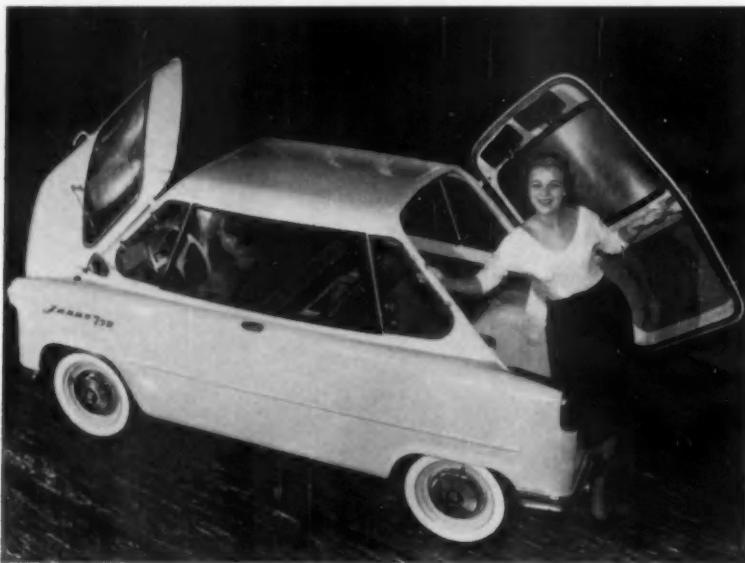
Heinkel Kabinenroller with front door and large window area.

SPECIFICATIONS OF GERMAN MINICARS

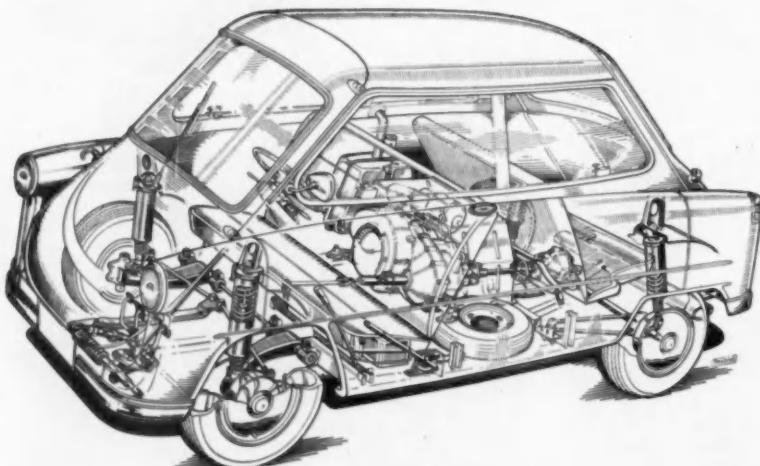
Make, Model	Engine				Transmission		Dimensions and Weight					
	Cap. cu in.	Pos.	No. of cyl	Stroke	Bhp @ rpm	Speeds	Drive	Wheel-base, in.	Tread Front/Rear in. in.	Lghth. Wdth. lb	Wgt. lb	
Spatz	12	R	1	2	10-5250	4	chain	76.8	45.7 45.7	133.9	57.1	705
Heinkel 200	12	R	1	4	10-5500	4	chain	67	48.2 58.7	102.7	53.9	628
Zündapp Janus	15	M	1	2	14-5200	4	shaft	71.8	45.8 48.5	112.6	55.1	882
Kleinschmitt F-250-C	15	F	2	2	15-5000	4	gear	74.8	39.4 41.3	124.0	55.9	650
BMW-Isetta 300	18	R	1	4	13-5000	4	chain	55.1	47.2 20.5	90.0	54.3	772
Goggomobil TS-300	18	R	2	2	15-4800	4	gear	70.9	42.9 42.9	120.1	53.9	926
Maico	27	R	2	2	18-4000	3	gear	79.5	47.2 45.8	134.6	57.9	1279

Abbrev.: Engine position: R=rear, M=center, F=front.

and allowed to rotate freely on the shafts. Coaxial sliding shafts with wedges and balls are used to lock the gear wheels to the hollow shafts. The sliding shafts are moved by solenoids, of which two, one for each transmission ratio, are located at the end of each hollow shaft. Any speed can be preselected electrically by a selector lever, and the actual shift is executed electrically by switches actuated by the clutch pedal. The new transmission is said to give a very smooth and easy shift. The



Zündapp Janus is built symmetrically with one door at each end and two seat benches arranged back to back with centrally situated engine.



Phantom view of Zündapp Janus showing general arrangements, suspension details, spring struts.

Goggomobil range can be powered by engines of 10, 13 or 15 cu in. capacity, all built by the vehicle maker, Hans Glass GmbH, although proprietary engines such as the Fichtel & Sachs or the Ilo also may be used.

Similar to the BMW-Isetta, the Heinkel Kabinenroller again has a front door, but the steering wheel does not move when the door is opened. The windows of this vehicle are curved and have a large area. As a new develop-

ment, twin wheels with a very narrow track are used, and in case of a puncture one of the two

wheels can be used as a spare. Brakes work only on the front wheels, and the rear engine drives the rear wheels through an oil bath chain drive.

Most interesting of the new designs is the Zündapp Janus, a four-passenger car with back-to-back benches and doors at the front and rear ends. This is based on a project by the well-known aircraft firm, Dornier. The 15 cu in. engine is located in the center of the vehicle between the two benches, and power is transmitted to the rear wheels through a drive shaft. Rear suspension is by swing axle, and the front suspension arms design provides an anti-dip effect under heavy braking.

The body forms a very rigid structure, as no doors cut into the sides. Thus the steel floor and the side walls form a very stiff and light unit.

Glass-reinforced plastic body shells of very smooth contours are features of the little Spatz, a product of Bayerische Autowerke in conjunction with the Victoria motorcycle firm which builds the 12 cu in. engine. A central tubular backbone chassis frame is used to carry the body shell. Rear swing axle and front trailing link suspension are complemented by tubular spring struts. The rear wheels are driven from the rear engine by chain, and there is rack and pinion steering as in other minicars. A coupe top with swinging doors is available.

The small firm of Kleinschnittger is preparing a range of three new 15 cu in. front wheel drive models, which will be made in coach, business coupe and roadster form. Weight is 650 lb and a net output is 15 bhp.

A rear-mounted engine built by Heinkel is employed in the Maico



Lively performance is feature of larger Brütsch "Pfeil" with four wheels.

four passenger model, the most powerful of the present minicars. This make has a central tubular backbone member, the engine being carried behind, the transmission and the differential in front of the rear axle.

No reduction plans have been realized by the Brütsch firm which has been most active in developing prototypes all over the world. Latest models of this enterprise are the Mopetta, a three wheeler with one front wheel and a tiny 3 cu in. engine. Larger models are the three-wheeled Bussard (buzzard) and Zwerg (dwarf) versions, whereas the Brütsch Pfeil (arrow) is a quite imposing two-passenger vehicle with various engine possibilities up to the Lloyd 24 cu in. engine. All bodies are plastic.

Although the commercial outlook for minicars is not unfavorable at the moment, considerable



New export version of BMW-Isetta has hard top styling, is available with folding rear quarter and detachable delivery body.

misgivings are caused by the well-known intention of the NSU and Fiat firms to re-enter the very low price market. It is expected that these two firms will not try to capture this new market by un-

orthodox designs but rather by the application of familiar principles to the smallest multi-wheel motor vehicle which can be produced in very large quantities and at a competitive price.

• • •

The West German Air Force

UNDER the agreements made at Paris, the Air Force of the German Federal Republic is to attain its full strength by January 1, 1960. It will then consist of 20 wings, totalling 1236 first-line aircraft, and some 100,000 men, including civilian personnel. Since, under the Treaty, the West German Air Force is to serve practical purposes only, it will have no heavy bombers. It is to consist of the following formations: four wings of fighter aircraft, eight wings of fighter-bombers, three wings of reconnaissance planes, three wings of all-weather fighters, and two wings of transport planes. Each wing will have from 36 to 25 planes, and will be organized in three squadrons. Fighter and fighter-bomber wings will comprise 75 planes, reconnaissance wing 54, transport wings 48 planes, and the all-weather wings 36 planes each. All planes, other than transport, are to be jet-propelled. In addition to first-line aircraft, more than

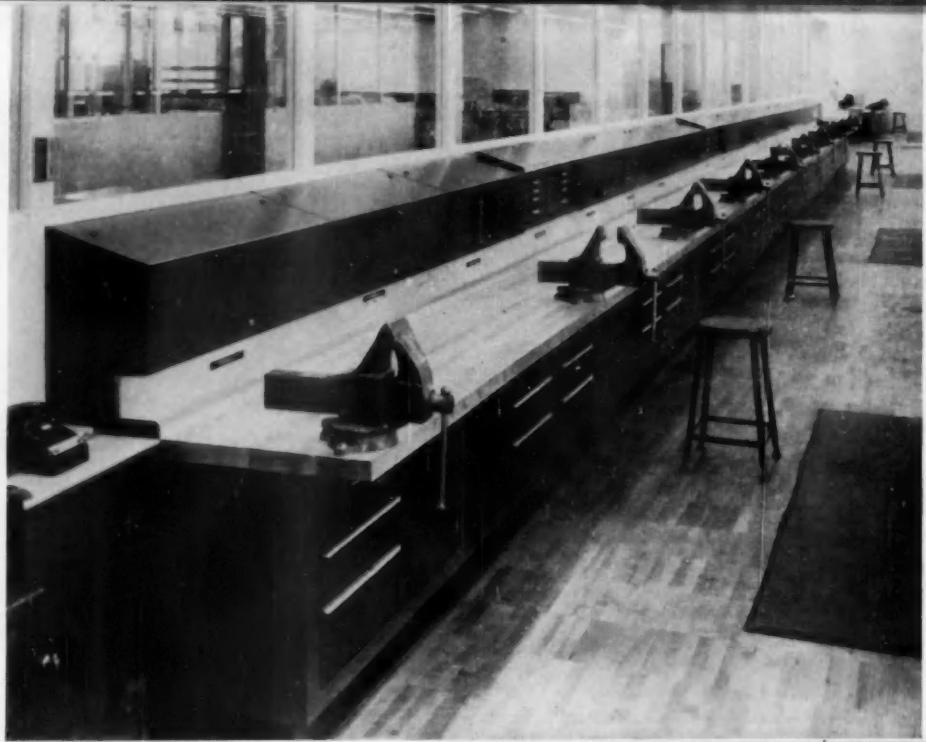
2000 auxiliary aircraft will be required by the German forces as a whole for communication, artillery spotting, and similar purposes.

As the build-up period will be devoted mainly to the training of flying and technical personnel, it is not considered a matter of the foremost importance whether or not all of the aircraft initially are of supersonic design, but for reasons of economy and logistic simplicity, it is desired to obtain as much uniformity of equipment as possible. With this point in mind, officials look, above all, to the United States, which promised an unspecified portion of the initial equipment under the foreign aid program. The following aircraft are stated to be most suitable: The F84F fighter-bomber, the F86K, or, better still, the F102 all-weather fighter, and the RF84F reconnaissance aircraft. Consideration has also been given to the Hawker Hunter and the French Super Mystère.

The view that the new air force need not be equipped with supersonic aircraft, applies to the initial period only. Thereafter, it is generally held, the very best designs should be made available. It is thought that the Western nations should pool their technical resources for the purpose of producing aircraft best fitted to European conditions. In view of the relatively short distances in Western Europe the required planes must be as light as possible to achieve maximum rates of climb, a performance of some 60,000 ft in two minutes being the aim. It is realized that this is a stringent demand, particularly with regard to the all-weather fighters with their heavy electronic equipment. As far as armament is concerned, German experts believe that rockets equipped with homing devices hold the future.

It is not considered that a program of such magnitude and intricacy could be carried out by any single country, or that the attempt should be made by the German

(Turn to page 176, please)



Ten 2-in-1 work stations are bolted together to make a long wall run. Hollow base through which utilities are introduced from the floor permits work station to be installed flush against wall, saving space and simplifying layout.

At right—GM space engineering provides each craftsman with variety of scientifically sized storage compartments. Small tools and precision instruments are stored in section of small drawers at top. The three large drawers beneath work surface take larger tools and supplies.

Working Space Increased by Two-in-One Shop Benches

THE problem of working and storage space in a two shift operation has been solved at the General Motors Technical Center, near Detroit, by installing a new type of shop bench. Now two men working different shifts share a single work bench and each man has more table-top work area than before and just as much storage space.

In tackling the problem, GM designers were faced with the fact that it was impractical to provide separate benches—one for the day, another for the night shift. Within the space limitations of the shops, no man would have had adequate table top work space. To team up two men on a conventional work bench would have created a problem of storage for each man's tools and supplies.

GM styling solved the problem by designing a king-size bench that combined separate storage space for the two men and yet allowed each man the full

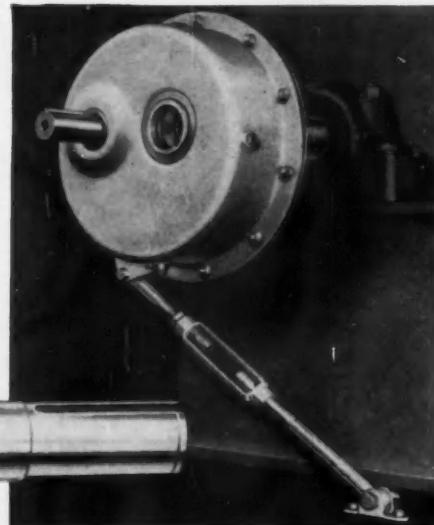
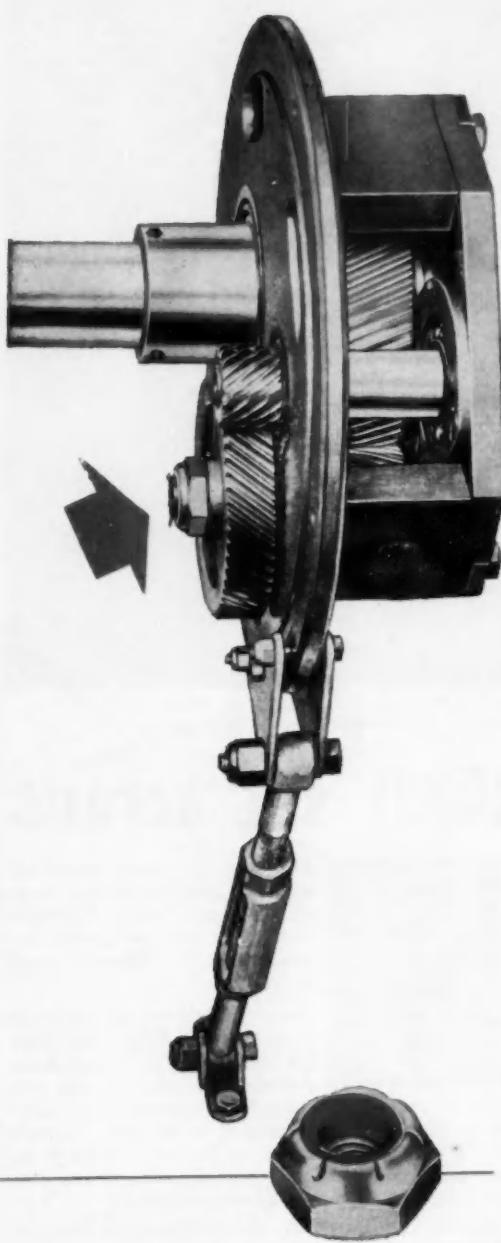


use of the bench-top work area during his shift.

This new 2-in-1 work station provides a full seven foot length of bench-top work area as compared with the conventional five- and six-foot units. For storage, the bench is divided into two halves, each containing 13 drawers plus cabinet space—all sized and located for convenient storage of a wide variety of hand tools and supplies.

The most unusual storage feature is the section of small drawers on the top of the bench. Here each craftsman has two tiers of five drawers, which provide conveniently sized and located storage receptacles for precision tools—micrometers, gages, caliper and other instruments. Patterned after a toolmaker's bench, the section provides easy access to small tools, thus keeping them, as well as tool boxes, off the work surface. A hinged panel with lock covers the drawers when not in use.

(Turn to page 111, please)



The Falk Corp., of Milwaukee, also uses Elastic Stop nuts in the tie rod assembly... and on the gear housing to maintain tight cover fit.

Elastic Stop® nuts solve critical gear adjustment problem in new speed-reducing unit!

In its rugged new Shaft-Mounted Drive, The Falk Corporation uses a self-locking Elastic Stop nut to secure the high-speed gear to the intermediate shaft, as shown in the illustration on the left.

The precision-made Elastic Stop nut stays firmly in place and the close seat-squareness tolerances maintain the exact original gear adjustment notwithstanding severe vibration caused by shock loads transmitted through the gears. Costs are cut because drilled bolt holes and cotter pins are eliminated.

Here's how this Elastic Stop nut works: The familiar red collar of the Elastic Stop nut is deliberately undersized in relation to the shaft (or bolt) diameter. It grips the shaft with a perfect fit, enforces a continuing self-locking pressure against the metal threads, and holds the nut securely in place at the desired point on the shaft. This same tight-fitting locking collar also provides a seal that prevents oil from seeping along the bolt threads, wherever oil seepage is a problem. And because the bolt threads are protected against moisture from without, the nuts cannot become "frozen" to the bolt by corrosion. The elastic recovery of the red collar permits extended re-use of Elastic Stop nuts.

Mail the coupon for information on how Elastic Stop nuts can solve your specific fastening problem.

ELASTIC STOP NUT CORPORATION OF AMERICA



Elastic Stop Nut Corporation of America
Dept. N67-15, 2330 Vauxhall Road, Union, N. J.

Please send the following free fastening information:

ELASTIC STOP nut bulletin

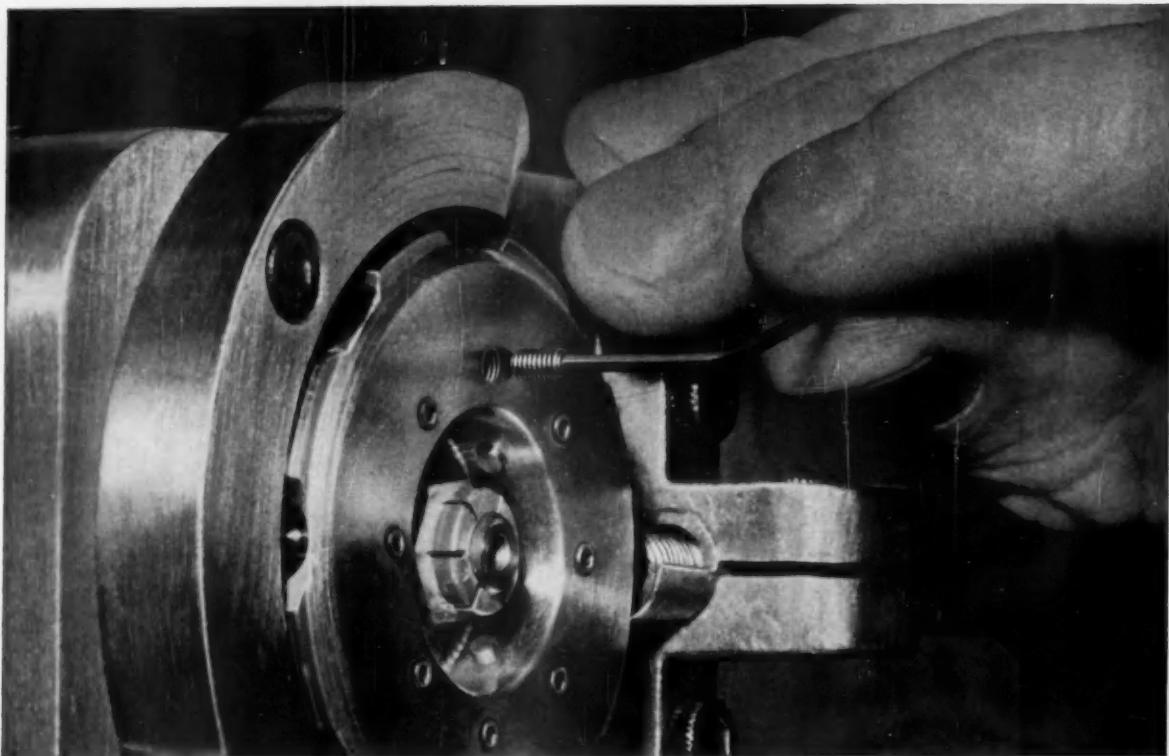
Here is a drawing of our product.
What self-locking fastener would
you suggest?

Name _____ Title _____

Firm _____

Street _____ Zone _____ State _____

City _____



Microsize UNBRAKO socket screws simplify design problems—even in highly specialized equipment like this prototype precision loading device for use in advanced automated production operations.

Miniaturize with UNBRAKO set screws

HEAT-TREATED ALLOY STEEL*

PLAIN CUP POINT

Class 3 Fit Standard

Diameter	Threads per inch		L Overall Length	Recommended Installation Torque in Inch-Pounds		Weight per Box of 100 in Pounds
	NC	NF		NC	NF	
#0 D .060 F .028	..	80	1/16	..	.5	.01
	..	80	1/32	..	.5	.01
	..	80	1/16	..	.5	.01
	..	80	1/32	..	.5	.01
	..	80	1/16	..	.5	.01
	..	80	1/4	..	.5	.01
#1 D .073 F .035	..	72	1/16	..	1.5	.02
	..	72	1/32	..	1.5	.02
	..	72	1/16	..	1.5	.02
	..	72	1/32	..	1.5	.02
	..	72	1/16	..	1.5	.02
	..	72	1/16	..	1.5	.02
#2 D .086 F .035	56	..	1/16	1.5	..	.03
	56	..	1/32	1.5	..	.03
	56	..	1/16	1.5	..	.03
	56	..	1/32	1.5	..	.03
	56	..	1/16	1.5	..	.03
	56	..	1/4	1.5	..	.03
#3 D .099 F .050	48	..	1/32	5.0	..	.04
	48	..	1/16	5.0	..	.04
	48	..	1/32	5.0	..	.04
	48	..	1/32	5.0	..	.04
	48	..	1/4	5.0	..	.04
	48	..	1/4	5.0	..	.04

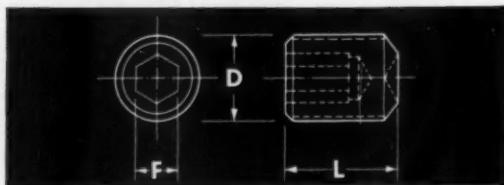
*Also available in stainless steel



You need not design special set screws to secure your new miniaturized equipment. Microsize UNBRAKOS were developed specifically for use in modern small devices.

UNBRAKO screws are made of carefully selected alloy steel. They are manufactured to timepiece precision. Sockets are deep and uniform for greatest wrench engagement and longest reuse. Threads are fully formed for maximum strength and exact fit. And UNBRAKOS are heat treated to the optimum condition for high tensile strength and ductility without brittleness or decarburization.

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SOCKET SCREW DIVISION



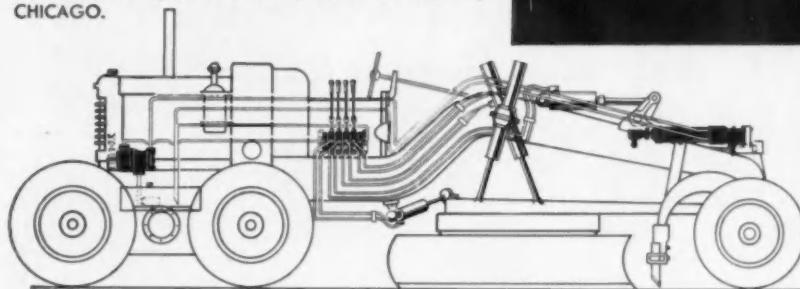
JENKINTOWN PENNSYLVANIA

"Nobody puts a fine painting in a dime-store frame." When you see a piece of construction equipment with Vickers Hydraulics, you know it is a "quality" machine throughout.

Vickers provides all the inherent advantages of hydraulics and MUCH MORE: (1) the benefits of a nation-wide and full-time field engineering and service organization of unequalled experience; (2) a complete line of equipment enables Vickers to take UNDIVIDED system responsibility thus eliminating any risk of incompatibility of hydraulic components; (3) a hydraulics school for free training of customers' maintenance personnel.

SEE VICKERS HYDRAULICS IN SIMULATED ACTION
IN BOOTH 219 AT THE ROAD SHOW, JANUARY 28
TO FEBRUARY 2, AT INTERNATIONAL AMPHITHEATRE,
CHICAGO.

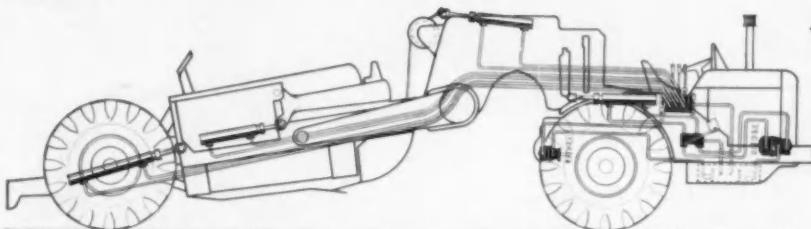
VICKERS[®] HYDRAULICS means "QUALITY" CONSTRUCTION EQUIPMENT



Motor grader uses Vickers Hydraulics for:

- maximum blade utility
- accurate and effortless tool adjustment
- positioning scarifier
- convenience of control to operator

Hydraulic motor (not shown) rotates blade on circle. Hydraulic power steering is separate circuit. Central hydraulic system is applicable.



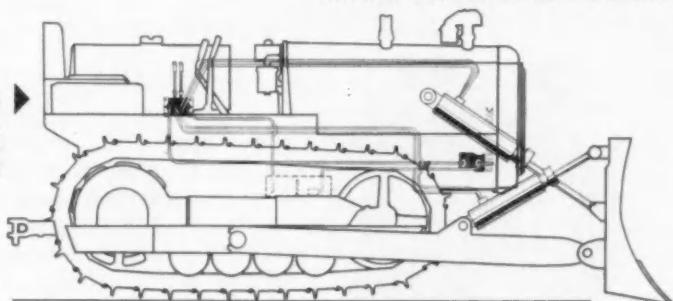
Scrapers have VARIABLE rate hydraulic power steering provided by:

- Vickers Double Vane Pump
- Vickers Metering Control Valve
- Vickers Circuit-Splitting Unloading System
- Vickers Overload Relief Protection

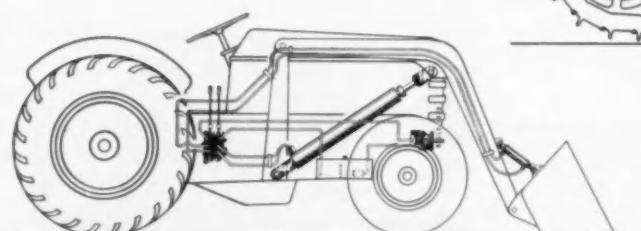
Vickers Single Vane Pump supplies power for:

- Fast actuation of bowl
- Fast apron manipulation
- Fast—Positive ejector action

More Work—Less Time—Minimum Maintenance.



Fast, easy and dependable operation of front end loader utilizes Vickers Balanced Vane Pump (with inherent automatic wear compensation) and Vickers Two-Section Directional Control Valve. Note simplicity of installation.



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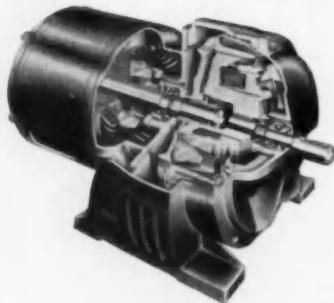
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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921



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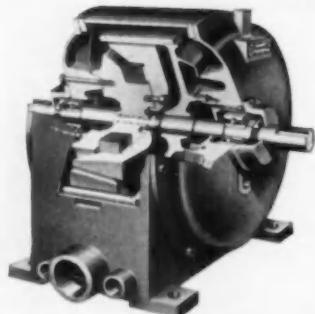
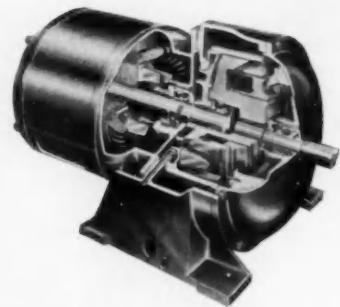


Ajusto-Spede® Drives

Dynamatic Ajusto-Spede® Drives supply infinitely adjustable speed from an AC power source—with low power losses and minimum maintenance. These air-cooled, stationary field, eddy-current couplings, integrally mounted with standard D-flange AC induction motors, provide a complete package-drive in sizes from 3 HP to 75 HP. Units of the same design and capacities are also available without motors.

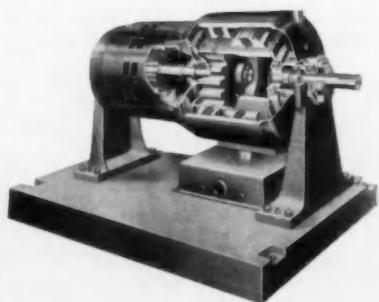
Dynaspede® Drives

These Dynamatic liquid-cooled, adjustable speed, Eddy-Current Couplings, integrally mounted with standard D-flange AC induction motors provide a compact self-contained drive in sizes from 3 HP to 75 HP. Motor types available are drip proof, totally enclosed fan cooled, and explosion proof. The coupling is completely enclosed. Separately mounted couplings are also available in capacities from 3 to 2500 HP and larger.



Eddy-Current Brakes

Dynamatic Eddy-Current Brakes are available in a wide range of torque capacities and operating speeds. Features include smooth, frictionless, shock-free operation with no rotating electrical components or contacts. Liquid-cooled types, as illustrated, provide loading requirements from 40 HP to 10,000 HP. Air-cooled units are available in sizes up to 50 HP.



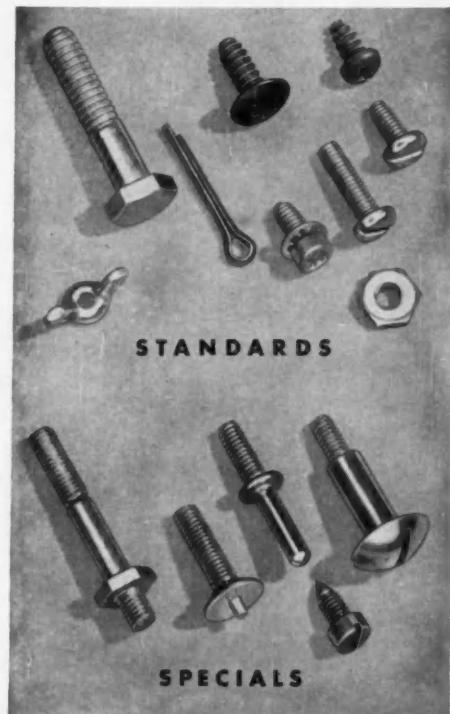
Dynamometers

Three types of Dynamatic Eddy-Current Dynamometers are available to meet various testing requirements; absorption dynamometers up to 15,000 HP; motoring or driving dynamometers up to 500 HP; and universal dynamometers to 500 HP and larger. Special purpose dynamometers are also designed for use in applications where requirements are unusual.

Send for Illustrated Literature Covering these Dynamatic Units

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Fasteners



Model chains

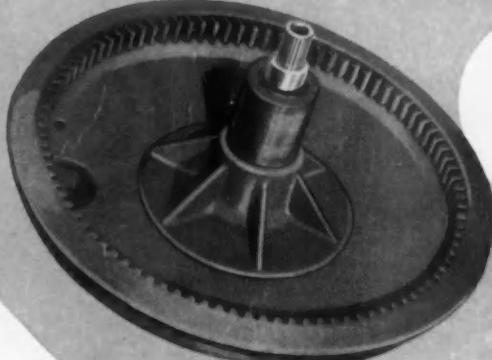


Chester hoists



Unit saves 2 1/4 man hours
on each shaft machined from

OSTUCO TUBING



Unit Crane & Shovel Corporation, Milwaukee, "lowered the boom" on costs by using OSTUCO tubing for vertical traction shafts in its line of heavy construction equipment. By eliminating a center-boring operation, Unit saved 2 1/4 hours machining time on each shaft.

OSTUCO tubing has tremendous strength to absorb the constant shock and strain to which Unit equipment is normally subjected and machines easily to precision tolerances.

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News of the MACHINERY INDUSTRIES

By Thomas Mac New

Unique Broaching and Fast Sawing Make Four Bearing Cap Sets a Minute

Natco has built in several new concepts in its latest bearing cap transfer machine, which is now hard at work in one of the large passenger car engine plants. The huge machine processes two sets of caps simultaneously, producing 240 sets of caps per hour.

Equipped with over 300 hp, the 27-station Natco automatically loads surface-broached castings, performs 80 operations and automatically positions two matched sets of bearing caps every 30 sec on the conveyor ready for assembly. The machine drills, reams, taps, broaches, turns, mills, probes, and faces.

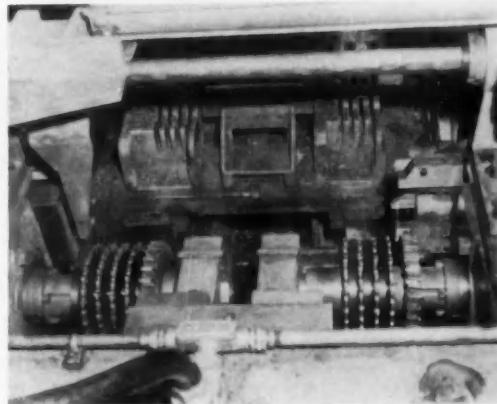
In the unique broaching operations, two castings are lifted out of the transfer mechanism and positioned by the broaching fixture. Four broaches, held by detents in upper collets, are fed down into previously drilled holes. The lower ends of the broaches are clamped by lower collets and the broaching cut is made, elongating the holes by 0.030 in. After

the broaches have passed completely through the holes, the collets retract, providing clearance for the castings to be returned to the transfer mechanism. Then the upper collets descend, retrieve the broaches and position them for the next piece.

The sawing station is also unusual with the casting again removed from the transfer mechanism and fed into the cutters. Cutting speed is increased to 14 ipm, using two 40-hp motors. Machines now on order will cut at 18 ipm. Employing carbide cutters, two castings are sawed into five separate caps and end-milled. All cuts are parallel within 0.0015 in.

(Turn to page 122, please)

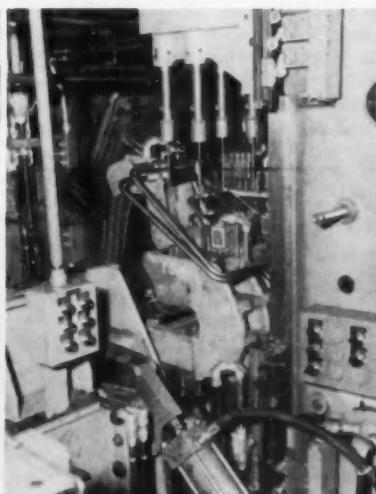
Two castings, fed into two 40 hp saws, are cut into two complete sets of five caps each on the Natco machine. All sawed surfaces are parallel within 0.0015 in.



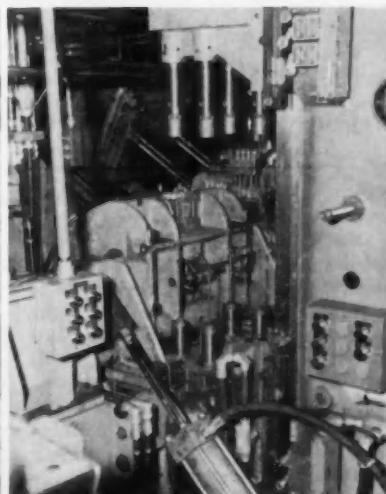
NATCO TRANSFER MACHINE FOR BEARING CAPS HAS UNIQUE BROACHING OPERATION



Four broaches are shown in the up position, and the fixture is in position to remove bearing cap castings from the machine's transfer mechanism.



Fixture has removed castings from line and positioned them for broaching. Upper collets will descend, lower collets clamp broaches and cut will be made.

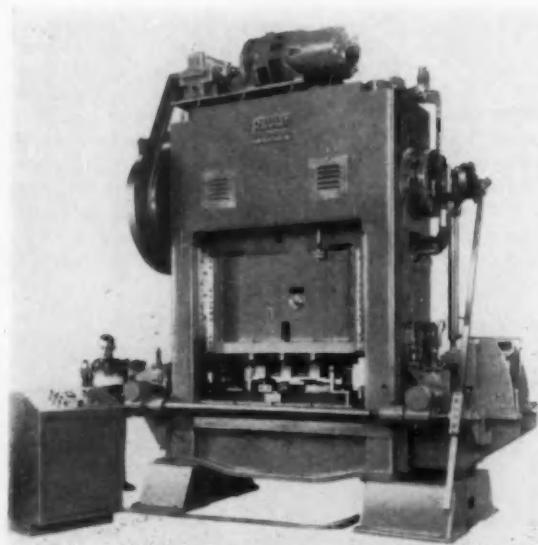


Broaching fixture has returned castings to transfer line. Upper collet will descend, removing broaches from lower collets and position them for next caps.

Survey in the Capital Goods Industries Shows Effects of the Internal Revenue 1954 Code on Depreciation Policies

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89



High-Speed 200-Ton Press With Console Control

Now being produced is a 200-ton high-speed Flexopress with speeds up to 250 spm. Powered by a 25-hp variable speed motor, it features console control. The announcement states that during check-out runs at the company's plant, the press was fitted with an eight-station progressive die and operated at 150 spm with a four-inch stroke. Attesting to smooth operation, a coin remained balanced on the edge of the bolster, according to reports.

The slide, which is fitted with four preloaded ball bearing raceways, is said to contribute to a high degree of vertical accuracy. Bottom of ram is stated to be parallel to bed within 0.0005-in. Equipped with air friction type clutch and scrap cutter, the press has double feed rolls mounted integrally for accurate stock feed. It has an all-steel frame, welded and keyed with four tie rods. *Precision Welder & Flexopress Corp.*

Circle 30 on postcard for more data

Soldering Iron

DESIGNED to handle all but the heaviest soldering jobs in sheet metal, electrical and plant maintenance work, the Prest-O-Lite 406 medium soldering iron operates on acetylene. It is stated to heat up to full working temperature in less than two minutes, and to be capable of doing the work of a pair of furnace-heated three-pound irons or an 880-w electric iron.

Stainless steel stem and tube-within-a-tube construction retards heat conduction to the handle and is said to assure operator comfort even after prolonged use. A needle valve at the

rear of the handle makes possible precise flame adjustment without overheating the copper head. It is available with interchangeable pointed or chisel-type soldering heads. *Linde Air Products Co.*

Circle 31 on postcard for more data

Outdoor Lift Truck

POWER brakes, power steering and finger-tip directional control are standard on an 8000-lb capacity, pneumatic tire fork-lift truck, the Yardlift 8024, now available. With four speeds in each direction, the truck will

travel at 16½ mph forward and 16 mph reverse, and climb a 21 per cent grade loaded.

A "feather-action" spool-type valve with built-in pressure relief controls the hydraulic system and provides lift speeds of 48 fpm empty and 42 fpm loaded. The axle-mounted telescopic upright tilts 4 deg forward and 12 deg backward. An automatic "tilt-lock" valve prevents upright drift.

With a length of 132 in. and width of 77 in., the Yardlift 8024 has a turning radius of 134½ in. Wheelbase is 86 in.

The unit is powered by a six-cylinder Continental gas engine of 209 cu in. displacement. The drive axle is a full-floating spiral bevel pinion and ring gear type. A 12 in. diam single disk, dry plate clutch, with capacity of 245 lb-ft of torque, is controlled by foot pedal.

The vacuum power operated hydraulic brakes provide 180 sq in. of braking surface. An independent hand-controlled parking brake operates off the drive shaft. Power assist steering is of the continuous follow-up type, and operates uniformly



Clark Yardlift 8024 outdoor truck

throughout the engine speed range. Mechanical linkage gives control when engine is not running. *Clark Equipment Co.*

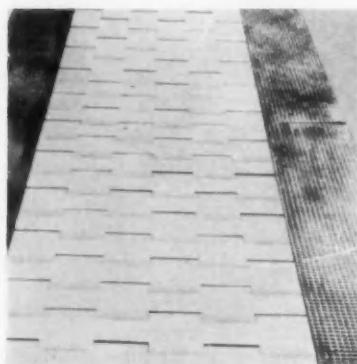
Circle 32 on postcard for more data

Conveyor Belting

FLAT-TOP steel conveyor belting of a design recently introduced can be installed flush with the floor, thus providing a flat moving deck. In addition to having the advantages of ordinary slat type conveyor belt with its carrying surface located above the side chains, the flat-top conveyor is said to eliminate operating hazards resulting from the opening and closing of the slats as they negotiate convex and concave turns.

It is stated to be especially advantageous for use in flush-with-the-floor applications for heavy-duty assembly work. Belt clearances are reported to be such that ordinary bolts, nuts, small wrenches and small tools common to assembly line work will not fall through the belt. The belt length, width, speed and carrying capacity may be varied to meet individual application needs.

It is also said that the flat-top belt can be used in floor-mounted conveyors for handling a wide range of prod-



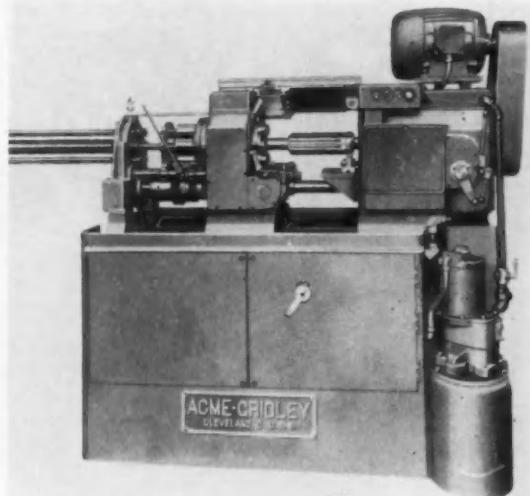
May-Fran flat-top conveyor belting

ucts. Because there are no stationary or moving parts that extend above the belt, it is advantageous for handling flat or formed-metal stock of greater length than the width of the belt; and these products may be placed on the conveyor at right angles to the belt travel.

The construction of the end-curved, precision-formed, interlocking and overlapping belt links provides the almost smooth-top carrying surface. At each pitch, through shafts extend to join the side chains and position them. Intermediate connectors that fit over the through shafts, and which are attached to the underside of the belt, tie the entire structure into an integral unit. *May-Fran Engineering, Inc.*

Circle 33 on postcard for more data

Acme-Gridley 7/16-in. RA-6 multiple-spindle bar automatic, designed primarily for small-parts high-production, is compact. It measures about 5 ft high and 5 1/2 ft long (16 ft including stock reel). Working position is nevertheless at a comfortable height. Also featured is ample room for adjustment and tool changes in an "open" tooling zone.



Multiple-Spindle Bar Automatic for Small Parts

DEVELOPED especially for the manufacture of small, high-production parts, the 7/16-in. RA-6 multiple-spindle bar automatic is the newest, smallest and fastest member of a line of machines. Included in the special tooling applications are second-operation attachments for threading, reaming, pickup and back burr, milling, and cross drilling. The machine is arranged for spindle speeds up to 4500 rpm in standard models, and up to 3200 rpm in models equipped with spindle stopping mechanism. Although the spindle capacity is 7/16-in. using standard collet and pusher tubes, it can be increased by using combined pushers and pusher tubes to accommodate 1/2-in. round or 7/16-in. hexagonal stock.

The toolslide of the machine is of flat surface design, with center keyway and parallel tee slots for holding down the hinge-type toolholders that are furnished at each spindle station; allowing the use of any standard type of end-working tools, as well as special toolholders of various design for operations requiring recessing attachments, etc.

The lower cross slides are hardened and ground, and are mounted in slide ways with removable hardened and ground strips and caps. The upper top slides are also hardened and ground and mounted in hardened and ground bases. Arrangement has been made for independently-operated auxiliary side slides in both the second and fifth positions. The fifth position slide is standard equipment and is usually used for cutoff; but if a pickup attachment and back finishing

slide are used, the cutoff can be mounted on top of a double deck toolholder in the sixth position.

All slides are operated by their own hardened and ground steel cams. Changing cam usually is unnecessary for most work as a normal set of cams can be installed on the machine which will handle the parts by changing the high speed dog and brake on the program drum, using the part of the cam required for a particular job. However, when cam changes are required they can be made quickly.

The complete cycle of the machine is 0.7 sec at high speed. The high speed segment of the drum shaft will be approximately 240 deg, adding an idle time of 0.466 sec to the machining time. *The National Acme Co.*

Circle 34 on postcard for more data

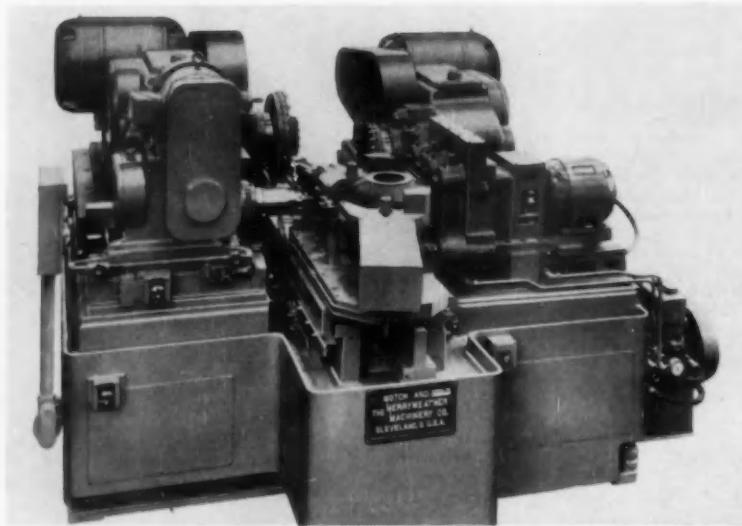
Ultrasonic Generators

AAILABLE for a range of industrial processing, a new series of ultrasonic generators are designed to drive a wide variety of low-impedance ultrasonic transducers. Accenting an untuned output system and featuring a 500-w rf power output plus a varied range of frequency levels, these generators are applicable for performing electro-mechanical techniques such as cleaning, chemical processing, soldering and drilling.

The series of generators, designated Glennite U-405, are blower-cooled, and operate at a nominal fixed frequency of 40-ke or at any frequency between 20-ke and 2-mc, depending upon model. *Gulton Industries, Inc.*

Circle 35 on postcard for more data

NEW
PRODUCTION
and PLANT EQUIPMENT



Match & Merryweather duplex milling machine mills, drills, rough bores and reams transmission housings at the rate of 27 parts per hour. Shown is the loading end of the machine where the operator loads the part in the fixture.

Machine Mills, Drills, Rough Bores and Reams

COMBINING several operations in processing farm equipment transmission housings, a special machine performs simultaneous milling of two surfaces, drilling, rough boring and reaming on 27 parts per hour in a series of automatic cycles.

In operation, the table rapid-traverses to the rear and then feeds past two opposed milling heads. After milling on return, three holes are drilled on one side and the cored

opening at the neck of the case is rough-bored on the opposite side, simultaneously. The table advances to the third and final station where three holes are reamed by the same six-spindle head used in drilling these three holes. All operations are automatic between load and unload. Clamping, movements and feeds are hydraulically-controlled. *Motch & Merryweather Machinery Co.*

Circle 36 on postcard for more data

Portable Air Nibbler

OPERATING on air power, a new metal cutting tool has just been introduced as an addition to a line of portable nibblers. The pneumatic tool is said to cut up to 55 ipm through 10-gage stainless steel without distortion on either side of the cut, leaving the edges ready for fabrication. Intricate patterns and special openings can reportedly be cut in sheet metal without the need for special devices.

The nibbler weighs 13-lb and measures 13-in. in length. Its frame is of cast aluminum. Anti-friction bearings on all rotating parts, hardened precision-cut gears, and pushbutton air valve attachment are other stated features.

The tool is powered by a heavy-duty Cleco air motor, at 90 psi minimum. Its capacity is 10-gage stainless, cold-rolled steel and galvanized

iron; 8-gage mild steel; aluminum, brass and other softer metals in proportion. Minimum cutting radius is six inches. *Fenway Machine Co.*

Circle 37 on postcard for more data



Fenway portable pneumatic nibbler

82

Enclosed Limit Switch

DEVELOPED for industrial control, limit and safety applications, a recently-introduced enclosed limit switch is versatile in application. Called the Licon Type 30, its versatility comes from interchanging components, three actuators and three housings, to form 16 types of switches. Die-cast aluminum housings provide a rugged enclosure, and a $\frac{1}{2}$ in.-14 internal tap conduit hub. Actuators include plunger, roller arm and roller plunger types.

The roller arm actuator has a micrometer screw adjustment which moves the arm through a wide arc in setting the trip point. When the switch trips, a slight additional turn is given to allow for overtravel, then the locknut is tightened. This method of setting the trip is said to eliminate the trial and error method, prevent borderline operation and offer an un-



Licon Type 30 enclosed limit switch with roller arm actuator

limited number of trip positions. The roller arm can be turned to take actuation from any direction.

The roller plunger type actuator is adjustable through 360 deg to take actuation from any direction, also. The plunger actuator type switch has a 0.002-in. movement differential and a $\frac{1}{2}$ -in. overtravel.

It is stated that switch actuation is sensitive, and that its "serpentine" mechanism largely eliminates switch fatigue and assures positive equipment actuation. Also that since the switches have no pivot points to cause variation in snap, they have no dead center and there is no flickering. A sealed version is said to be oil, dust and water tight by means of improved methods. *Licon Switch Div., Illinois Tool Works.*

Circle 38 on postcard for more data

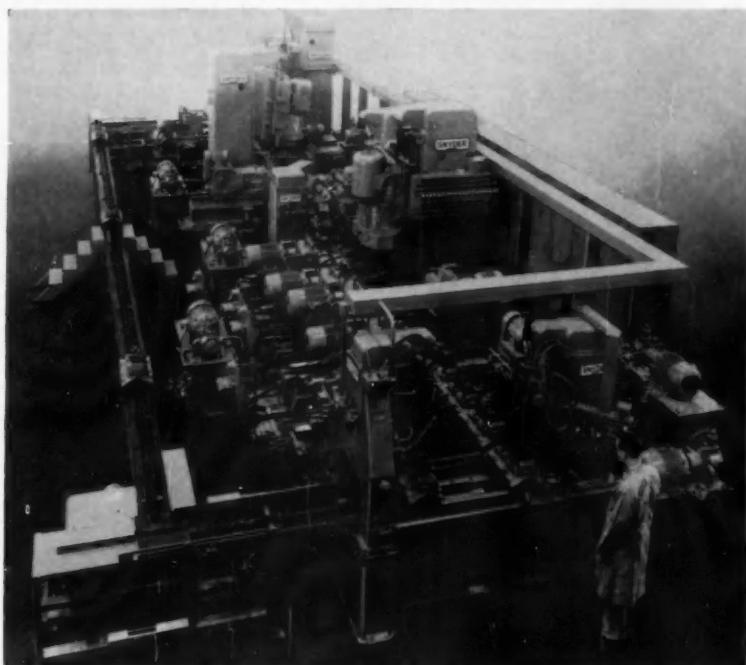
Palletized Transfer Machine Processes Steering Knuckles

SIXTY FEET in length, a 26-station segmented palletized transfer machine that mills, hollow mills, drills, spotfaces, taps and reams steering knuckles at the rate of 146 pieces per hour has been designed and built.

Two parts at a time are clamped in pallet-type fixtures that are moved from station-to-station in the machining section with a transfer mechanism. The pallets are returned to the first machining operation by a motorized conveyor through a wash and blow-off operation. An automatic fixture clamping means speeds part clamping and unclamping operations. The forgings are also clamped in a position that will provide uniform stock removal from machined faces. The parts are located in the fixtures by initially holding them down against vee-locators with hydraulic cylinders. Then the spring-operated jacks are hydraulically released and air wrenches automatically clamp the part.

The machine is designed for the handling of steel parts. At the machining stations where hollow milling operations are performed, coolant is directed to the machined surfaces through the milling cutter spindles as well as through external piping. All operations are performed with units that have individual bases and control panels to simplify maintenance and provide flexibility for part design changes.

Two parts are loaded in each fixture at station 1 on the hydraulically-operated, electrically-controlled machine. The lock-pin ends are milled to length in station 2 and the spindles are rough hollow-milled half-way at station 4. Bosses are straddle-milled in station 5. The spindles are rough hollow-milled the balance of the



Snyder segmented palletized in-line transfer machine processes forged steel steering knuckles, two parts at a time, at a net rate of 146 pieces per hour

length in station 6 and a thread is finish hollow-milled on each part in station 7.

Two lock-pin holes and two tap drill holes are drilled in station 8. The spindles are finish hollow-milled the full length at station 9, where two bosses are also spotfaced. At station 11, the lock-pin holes are reamed and two angular holes are drilled. Two holes are drilled in two steps at stations 12 and 13. Two holes are rough and finish-reamed at stations 15 and 16. Two holes are also countersunk at station 16. Eight mounting holes are

drilled at station 18, along with the drilling and chamfering of two holes.

A saw-cut is milled in station 20, and two holes are drilled to depth in station 21. Eight mounting holes are spotfaced in station 22, and two holes are drilled to depth in station 23. The two pipe tap holes are tapped in station 25, along with the threading of each part end. The parts are unloaded in station 26 after passing through a washing operation on the fixture return conveyor. *Snyder Tool & Engineering Co.*

Circle 39 on postcard for more data

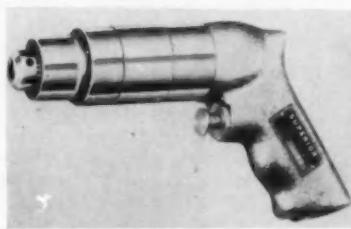
Industrial Air Drill

INCORPORATING a metering trigger for positive speed control from 0 to 2500 rpm, the model S-P 1000 industrial air drill has $\frac{1}{4}$ -in. capacity, has a safety chuck shield, and produces $\frac{1}{4}$ -hp at 90-lb pressure.

According to the manufacturer, it will reduce operator fatigue because of its weight of only two pounds. The manufacturer also states that its simple design, nickel steel gears and preloaded sealed bearings will result in minimum maintenance costs. The drill is available with pistol grip or

straight handle. *Superior Pneumatic & Mfg., Inc.*

Circle 40 on postcard for more data



S-P 1000 industrial air drill

Drawing Lubricant

MOYLKOTE Type 174X is a dry film lubricant which has been formulated for the drawing and forming of titanium, titanium alloys, chromium and stainless steels at elevated temperatures. The newly-developed lubricant consists of extremely fine particle size graphite combined with a high temperature binder and dispersed in an aromatic solvent system. It has reportedly been used successfully for drawing and forming at 600 to 1400 F. *Alpha Molykote Corp.*

Circle 41 on postcard for more data

NEW
PRODUCTION
and PLANT EQUIPMENT



Automatic Forming and Cutting-Off Machines

Two new versions of an automatic screw machine are intended for work which can advantageously be performed without spindle reversal. Both machines have a high spindle speed of 10,000 rpm for efficiency on free-machining materials, with a wide range of lower speeds for operation on tougher alloys.

Type 1 has a turret and vertical slide, and is identical with the automatic screw machine except for the

non-reversing spindle. It is designed for drilling, reaming, facing, turning, forming, knurling and cutting-off.

Type 2 omits the vertical slide, and the turret is replaced by a one-tool position slide. This unit is designed for various types of form and cut-off work.

Both machines are of $\frac{1}{2}$ -in. capacity.
Brown & Sharpe Mfg. Co.

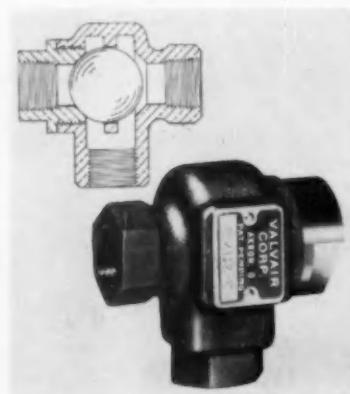
Circle 42 on postcard for more data

Control Valve

A DIRECTIONAL valve which is said to afford instant switch-over from automatic to manual control of diaphragm-operated valves, cylinders and similar devices, has been revealed. The valve, installed as a tee in the inlet lines, permits manual take-over from automatic control, or control from two different sources, whenever desired. It also can be used to prevent intermixing of supply when two gases or liquids are being delivered alternately to a tank or container. Completely automatic in operation, the directional valve can be substituted for a dual top valve, the manufacturer says.

Simple in design, the device consists of a captive Hycar ball which shuttles between two seats in the Navy M bronze valve body. When pressure is applied to one port, the

ball shifts to, and seals, the opposite port. Suitable for use with air, oil, water or media compatible with Hy-



Valvair directional control valve

car and bronze, the valve is available with $\frac{1}{4}$ and $\frac{3}{8}$ -in. N.P.T. ports. Net open area between seat and ball is equal to transverse area of $\frac{3}{8}$ -in. standard pipe. *Valvair Corp.*

Circle 43 on postcard for more data

Scrap Chopper

For meeting the problem of handling coil and strip stock scrap immediately after stamping, a press room accessory that chops the scrap into sizes easily stored for collection has been introduced. It is said the unit's unique orbital shearing action of hardened steel blades allows equal opening at each end of the cutting blades, thus permitting free entrance of material through the blades. Also that if stock too thick is accidentally fed between the blades, it simply stalls the unit without danger of parts breakage or motor overheating.

The machine may be tipped at any angle to suit the feeding material. The chute through which the material passes to the cutting blades has a reciprocating action which is claimed



Cooper Weymouth scrap chopper

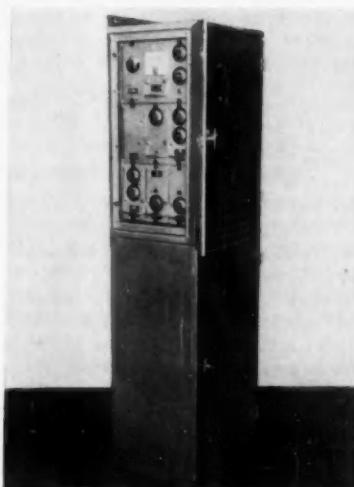
to prevent the stock from hanging up. Cutting blades are $\frac{3}{8}$ -in. thick, ground on one surface only, are self-aligning, and may be reground down to half the original thickness and still be used.

The scrap chopper is powered by a 1/3-hp, 115/230-v, single phase, 60-cycle drive. The model now in production has a capacity of 6-in. wide by 0.065-in. mild steel; larger capacity models will be available at an early date, it is said. *Cooper Weymouth, Inc.*

Circle 44 on postcard for more data

Welding Control Panels

NON-SYNCHRONOUS resistance welding control panels, in a complete line, have been announced. The line features unitized plug-in control units, hermetically-sealed relays and other long-life components, and standardized enclosures with swing-out frames. It is said to be the first to combine the advantages of electronic control with the benefits of hermetically-sealed relays. The relays provide long life, consistency, and improved overall performance in welding control, while



A three-tier General Electric non-synchronous resistance welding control enclosure mounted atop an ignitron contractor enclosure

the electronic unit timer eliminates the adverse effects of voltage fluctuations.

The building-block technique of unitized plug-in control units has been employed to obtain maximum flexibility. Engineers say this technique makes possible the building of custom-made panels for any non-synchronous application, as well as panels for standard NEMA combinations. It also provides a simplified method of adding units to existing controls and offers standardized dimensions and appearance of enclosures. The basic unit size is 4 in. wide by 8½ in. high by 8 in. deep. All units have the same height and depth, but vary in width from 4 to 12-in., depending upon space requirements of the individual unit.

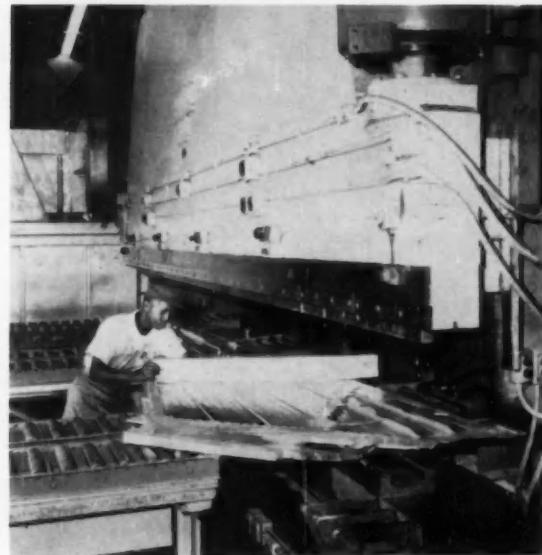
Swing-out frames within the enclosures are featured. These frames, which house the various plug-in control units, can be swung out for easy maintenance and accessibility.

Enclosures for all ignitron contractors, standard or custom timers, and

The hydraulic press brake shown is said to provide the accuracy necessary for straightening wings of supersonic planes. Operating on the air bending principle, it can reportedly be controlled for depth of stroke to within thousandths of an inch, thus making it possible to compensate for metal spring-back. The ram can be tilted to conform with the work. North American Aviation, Inc. is using this 300-ton, 16-ft long unit for straightening sculptured aluminum alloy wings. (Pacific Industrial Manufacturing Co.)

Circle 45 on postcard for more data

Press Brake Straightens Aircraft Wings



auxiliary controls (such as heat control, current regulators, etc.) have standard base dimensions of 15 in. deep and 20 in. wide. The only variation is in height, which ranges from 12 to 38½ in. Individual or combination control panels are suitable for wall, floor, or machine mounting. They may be stacked, mounted parallel, or mounted separately.

Access doors are flush with the front and side of the enclosure and are provided with locking-type handles. The swing-out frames are normally mounted so the control dials of plug-in units are accessible through the front door, although frames can be installed to provide side door access.

Each plug-in control unit has been engineered to provide maximum flexibility and accessibility. Industrial printed circuit wiring boards with plug-in terminals are utilized to simplify circuitry. General Electric Co.

Circle 46 on postcard for more data

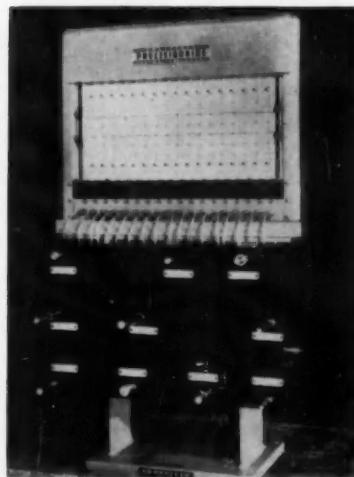
Barrel Finishing Media

STATED to be ideally suited for barrel finishing hard-to-contact recesses or intricate shapes, Tumblex "S" abrasive spheres come in five different diameters and are made of the company's Alundum aluminum oxide abrasive. The announcement says they are a satisfactory media for finishing tubing, coil springs, bearing retainers, pump bodies and other parts

where conventional materials may tend to wedge or not reach. It is also said the spheres are dense and long-lasting, providing good cutting action with economy. Norton Co.

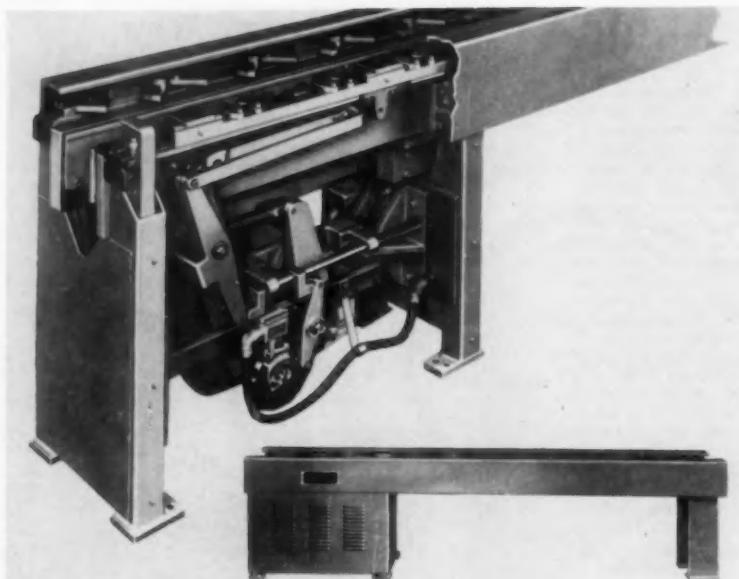
Circle 47 on postcard for more data

Inside Diameter Gage



This progressive-type Precisionaire pneumatic gage checks 18 various size diameters of a truck transmission control valve body for size and out-of-roundness. Seven of the 11 chrome-plated spindles are of the "step" type and have two sets of air jets for checking two different diameters at the same time. (The Sheffield Corp.)

Circle 48 on postcard for more data

NEW**PRODUCTION
and
PLANT EQUIPMENT***Dixon in-line table for station-to-station transfer of workpieces***In-Line Transfer Table, Without Fixtures**

An in-line transfer table, without fixtures, which will transfer piece parts from station to station for automatic or manual operations, has been introduced. It can be adapted

to multiple, consecutive operations and will reportedly handle up to 6400 pieces per hour. Designed for piece parts which have a flat surface, the transfer table will cam lock parts at

each station within 0.005-in. tolerance without auxiliary locating devices. When the tolerance is less than 0.005 in., a shot pin or locating lug on the part may be utilized.

Acceleration and deceleration during indexing are at high speed. Index distance can be varied from three to nine inches and index time from 0.25 to 0.7 sec. The dwell time is also adjustable.

The base support of the table contains the drive unit and may be located at either end or in the middle of the table to suit requirements. The in-line construction allows operators to work from both sides of the table; machines are accessible from either side for adjustment or tool replacement. *Dixon Automatic Tool, Inc.*

Circle 30 on postcard for more data

Vacuum Lift System

ANNOUNCEMENT has been made of a material handling system called Vac-U-Lift which uses induced vacuum in combination with single or multiple Vac-U-Pads for lifting and holding non-porous materials. The system utilizes a power pack which has a rotary pump, controlled by a five-way solenoid valve, for creating vacuum to 28-in. mercury.

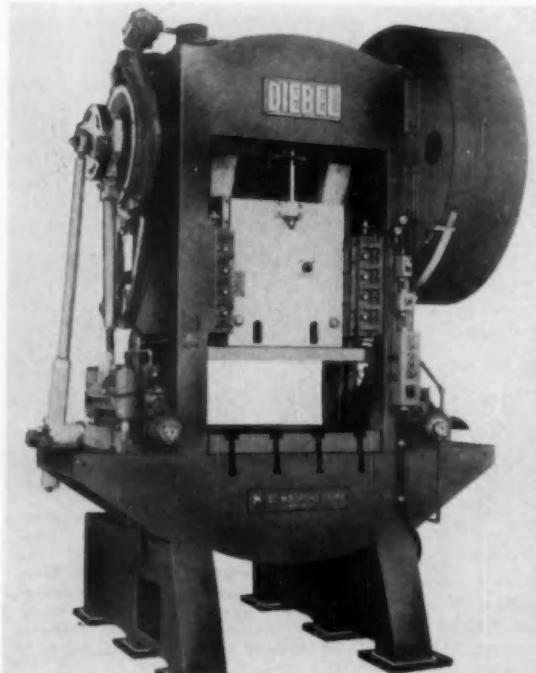
The pads are of metal construction in various shapes to fit particular applications. Positive sealing is controlled through a special sealing ring attached to the perimeter of the pad. No load is reportedly imposed on the sealing ring, the Vac-U-Pad coming in direct contact with the material and the seal ring only acting to create the vacuum. Safety is provided by a reserve vacuum system which maintains a grip on the material while lifting, in the event of power failure.

It is said the system has been found to be the solution to the handling of non-porous materials where size, flexing and surface protection are important considerations. Grease, oil or other protective coatings do not impair its efficiency. The system can be used in conjunction with lift trucks, cranes or hoists.

Round Vac-U-Pads are available with ball and socket attachment, ball socket locking type and rigid type from $2\frac{1}{4}$ to 18-in. diam with lifting capacities from 25 to 1200 lb each. Rectangular pads are obtainable from 5 by 15-in. to 12 by 35-in., with capacities from 275 to 2000 lb each. They are also available in special designs for work with various radii, such as pipe and tanks. *Vac-U-Lift Co.*

Circle 49 on postcard for more data

Circle 51 on postcard for more data

Automatic 150-Ton Unit Added to Press Line

The latest addition to a line of high-production automatic presses is this 150-ton machine. Bed size is 40 by 32-in. or 56 by 32-in.; width of feed 18-in.; length of feed 0 to 13 $\frac{1}{2}$ -in.; and speed range 70 to 210 s.p.m. Standard equipment includes air clutch and spring-applied brake, special shock mounts, and safety shut-off devices. Also a new full recirculating lubrication system for all main bearings and the slide. The company states this press was engineered to handle lamination work, progressive blanking and forming, and large blanking work. (Di Machine Corp.)

Circle 49 on postcard for more data

Carbide Drills, Reamers

THE addition of a complete range of precision ground solid carbide drills and reamers to its rotary tool line has been announced by a company. The new tools will bear the "Golden Circle" name, which already includes carbide end mills and rotary burrs.

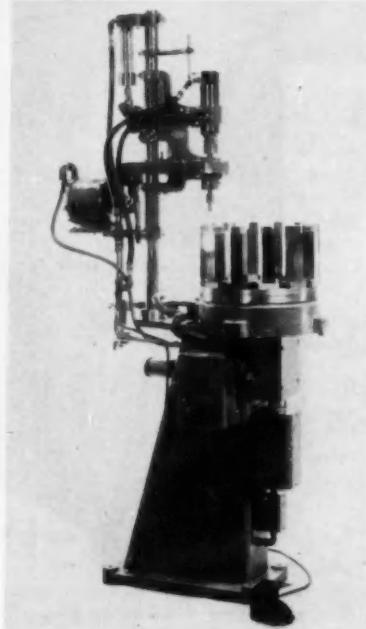
The twist drills will range in size from No. 60 wire gage to $\frac{1}{2}$ -in. diam, and the reamers from 0.050 to $\frac{3}{8}$ -in. *Elgin National Watch Co.*

Circle 52 on postcard for more data

Index Riveter

EQUIPPED with specially-tooled index units, Airflex "spin-impact" floor model riveters can reportedly save considerable production time through the multiple stations which result, plus an automatic work cycle.

The unit pictured was designed particularly for carburetor throttle shaft and lever assemblies. It is stated that only the Airflex was capable of joining the lever to the shaft by simply bucking off the shaft end. The opera-



Airflex index riveter

tion had previously been done by single stage riveting, using a complicated air vise for adequate shaft support. Work time was reduced from a high of 30 sec by the former method, to 6 sec.

Operation of optionally timed intervals is controlled by an electric foot

switch, which initiates the automatic work cycle. The air hammer delivers up to 16,000 blows per minute; while spindle rotation (electric motor driven) can be obtained in either 500 or 1200 rpm. Air requirement in the several hammer capacity sizes ranges from 40 to 100 psi. Rivet diameters to $\frac{3}{8}$ -in., based on solid mild steel, can be accommodated. *Lemert Engineering Co., Inc.*

Circle 53 on postcard for more data

Broach Pullers

TO meet the needs for finishing holes in aircraft structures to tolerances as close as ± 0.0005 -in., two tools have been developed identified as CP-658 and CP-659 Pneudraulic portable broach pullers. It is said that ordinarily, to ream holes to these tolerances, several passes had to be made with a series of reamers; and that this procedure could not produce holes of the required accuracy in sandwiches of dissimilar materials such as aluminum and steel. But that holes can now be finished to these close tolerances in a few seconds with one of the new broach pullers.

The pullers are powered by a CP-805-ARDR Pneudraulic power unit which requires a 90 psi air supply. The broach is inserted in the drilled hole from the rear and the tool nose placed over the broach shank. Squeezing the tool trigger admits a controlled supply of high-pressure oil

from the power unit to the tool cylinder; automatically closing the chuck on the broach shank and pulling the broach through the hole. A stream of



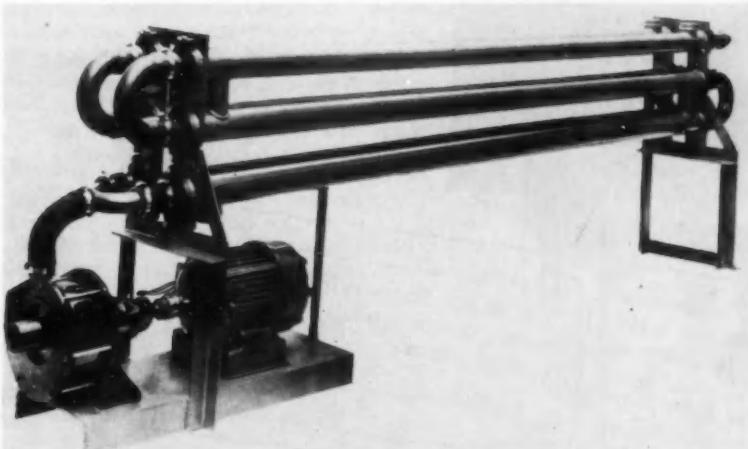
Chicago Pneumatic broach puller for finishing holes in aircraft structures

air continually cleans chips from the broach. This one pass of the broach is said to produce a clean accurate hole. Air pressure returns the piston to forward position, where the chuck automatically opens and the broach is removed for the next operation. *Chicago Pneumatic Tool Co.*

Circle 54 on postcard for more data

(Turn to page 114, please)

Heat Exchangers for Processing Tanks



Illustrated is one model of higher-capacity units, composed of jacketed exchangers and pumps, that were recently added to a line for heating or cooling the new larger plating, anodizing and pickling tanks now being installed. Available in capacities up to 3,200,000 Btu/hr in one unit, they can be provided with built-in temperature controls for either heating or cooling. (Carl Buck & Associates)

Circle 55 on postcard for more data

Guarantee **TOP** Performance and Maximum Life!

Specify THESE **TOP** QUALITY FEATURES...

(Standard on Miller Cylinders at no extra cost)

Specify CASE
HARDENED
CHROME PLATED
PISTON RODS

On all Air and
Hydraulic Cylinders

Specify
"TEFLON" WIPERS

On all Air and
Hydraulic Cylinders

Specify TEFON
HYDRAULIC
ROD SEALS

On all Hydraulic Cylinders

Specify RUST
RESISTANT
SURFACES

On all Air and
Hydraulic Cylinders

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To (Dept.) _____
"On all our future cylinder require-
ments, please specify the above
quality features."

Signed _____

Title _____

Benefits To You

CASE-HARDENED Piston Rods (52-54 Rockwell "C") provide practically complete protection against damage from hammer blows, wrench-dropping, mishandling, and similar occurrences. Available from Miller at no extra cost.

The HARD CHROME PLATING over the case-hardened rods protects against scratch-damage and rust. Available from Miller at no extra cost.

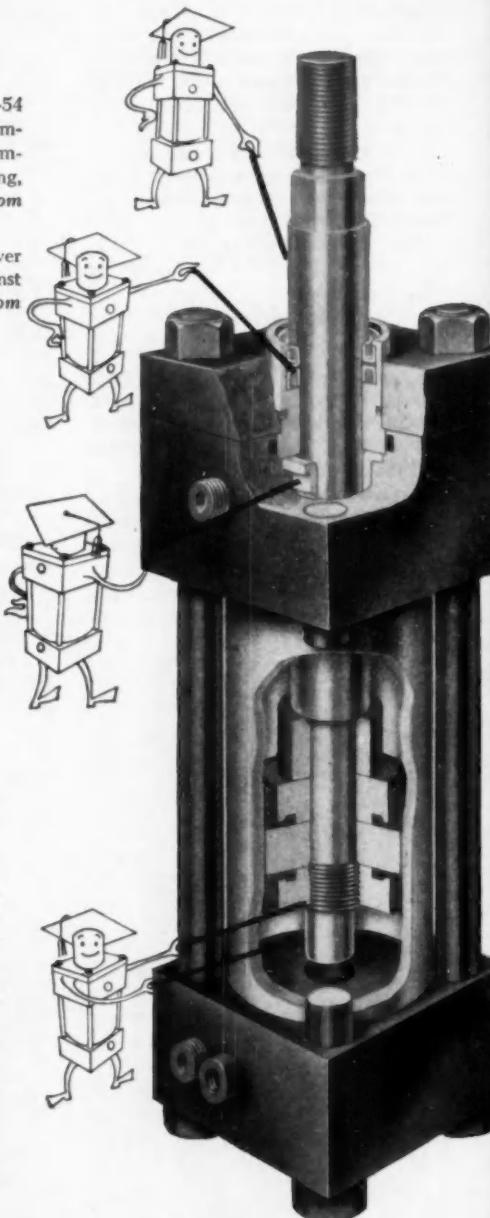
Benefits To You

"TEFLON" Rod Wipers and "TEFLON" Hydraulic Piston Rod Seals withstand temperatures from -100°F. to plus 500°F. They are impervious to practically all known chemicals, including the fire-resistant, special, and standard hydraulic fluids in current use. Available from Miller at no extra cost.

Benefits To You

Highest quality Black Ferric Oxide Finish provides rust protection in air cylinder operation and on all cylinders during shipping and installation.

Cylinder heads, caps, mountings, pistons, followers, tie rods, and the unplated portions of the piston rods have this finish at no extra cost on all Miller cylinders. (This finish not recommended for water service)



NOTE. On all Miller Hydraulic Piston Seals: Leather Cup Seals are standard, Piston Ring Seals are optional at no extra cost, and "Teflon" Cup Seals are available at extra cost.

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Free INFORMATION SERVICE

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USE THIS POSTCARD

FREE LITERATURE

Starting Device

Publication 1062, four pages, describes an electrically-operated device called Thermostart for assisting the starting of Diesel engines at low temperatures. *C.A.V. Fuel Injection Equipment Div., Lucas Electrical Services, Inc.*

Stamping Lubricants

Four-page bulletin 138 is a new publication on the subject of lubricants for stamping and deep drawing, and includes a chart showing the types recommended for specific applications. *Magnus Chemical Co., Inc.*

Machine Switches

Heavy-duty precision switches for machine tools and other industrial equipment are covered in eight-page publication Form 84-222. *Micro Switch Div., Minneapolis-Honeywell Regulator Co.*

Force Gages

A complete line of mechanical force gages usable for measuring both tension and compression loads up to 200 lb, and specifications on 18 models are shown in bulletin 750c, six pages. *Hunter Spring Co.*

Dust Control

"Dust Control for Industry" is the subject of bulletin 922, 16 pages, which encompasses a complete range of dust control equipment and accessories. *Pangborn Corp.*

Sprag Clutches

Data concerning sprag clutches for overrunning, indexing, and backstopping applications is contained in Catalog 104-C, 26 pages, published by the *Formsprag Co.*

Alignment Testing

The fundamentals of the alignment method for testing and measurement are discussed in an eight-page pamphlet available from *Engis Equipment Co.*

Hexagon Nuts

Eight-page condensed brochure 7-Na contains basic engineering data on a line of hexagon nuts, 12-pointer nuts, and specific types of locknuts. *National Machine Products Co.*

Silicone Lubricants

Given in eight-page publication 6-101 are the properties and performances of various silicone oils, greases and compounds. *Dow Corning Corp.*

Steel Springs

The company's facilities for producing hot and cold-wound steel springs of large and small sizes, and in various types, are outlined in a 16-page publication. Included are design recommendations and a chart listing the physical properties for calculating springs in 22 materials. *Alco Products, Inc.*

(Please turn page)

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Lubricant Additive 11

The function of moly-sulfide as a lubricant additive and some of its commercial uses are described in 12-page bulletin Lu-6, available from *Climax Molybdenum Co.*

Radial Draw Formers 12

Bulletin AHS-956, four pages, describes radial draw formers for high-speed production of body parts and moulding. *The Cyril Bath Co.*

Coated Fabrics 13

Four page bulletin F-56 lists the properties and applications of silicone rubber coated fabrics and nylon resin coated fabrics, usable for diaphragms, gaskets, seals, belts, ducting, or low-temperature protective covers. *The Connecticut Hard Rubber Co.*

Tap Drivers 14

Three types of "Safe-Torque" drive release tap drivers are covered in eight-page bulletin 20-50, released by *Scully-Jones and Co.*

Powdered Metal Parts 15

A 12-page brochure on the subject of powdered metal parts, briefly describes processing and finishing operations, and gives references for standards and specifications. *The Lux Clock Manufacturing Co.*

Plastic Reinforcements 16

Asbestos products for reinforced plastics are completely outlined in 20-page bulletin T-56, which includes their physical properties and application data. *Raybestos-Manhattan, Inc.*

USE THIS POSTCARD

Steel Data 17

The revised edition of a 256-page pocket-size steel data book gives information on machining and fabrication, specifications and tolerances, weights and dimensions, elements and safe loads. *Joseph T. Ryerson & Son, Inc.*

Jib Cranes 18

A line of self-supporting jib cranes, available in capacities from 6 to 15 tons, and requiring less than five square feet of floor space to serve an area of 1936 sq ft, is discussed in four-page folder. *R. G. LeTourneau, Inc.*

Ultrasonic Generators 19

Bulletin DR-2000 describes high power ultrasonic generators and transducers, including two models applicable for powering high volume batch or automated ultrasonic cleaning, machining and liquid processing systems. *Acoustica Associates, Inc.*

Furnaces 20

A series of graphite tube furnaces for temperatures to 5000 F is described in bulletin CT-1156, which contains specification and dimensional data on 17 standard models. *Harper Electric Furnace Corp.*

Presses 21

Latest developments in a line of automatic multiple transfer presses for high production of small parts, are contained in a new 12-page bulletin. *The Baird Machine Co.*

Cylindrical Grinders 22

Standard and special-purpose precision grinding machines are described in 28-page condensed general catalog CG-56, issued by *Landis Tool Co.*

Stainless Steels 23

An eight-page data sheet on chromium-nickel-manganese stainless steels of a new family possessing desirable mechanical and corrosion-resisting characteristics, gives such information as intergranular corrosion, mechanical properties, analysis, and stress rupture properties. *Allegheny Ludlum Steel Corp.*

Thermal Imaging Unit

The Evaporograph, a direct thermal imaging device for locating and monitoring either hot or cold spots in conducting temperature studies of equipment, is discussed in bulletin RD-515, 11 pages. Request on company letterhead from *Baird Associates-Atomic Instrument Co., 33 University Road, Cambridge 38, Mass.*

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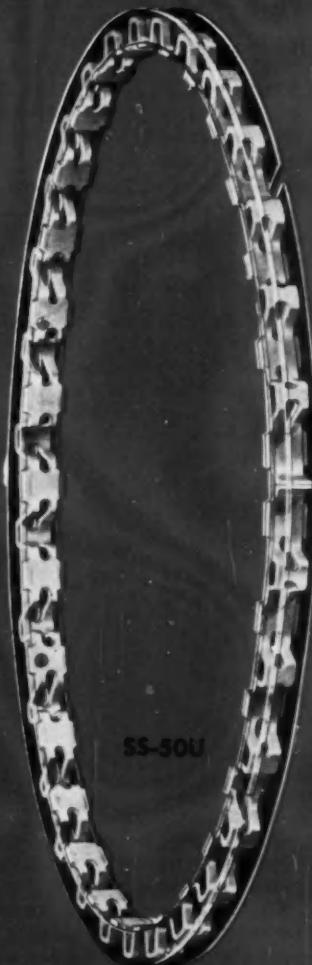
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Stainless Steel Oil Ring



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DESIGN ADVANTAGES:



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Circumferential abutment type design makes the ring independent of contour and depth of piston groove. Consequently, it can exert its pressure uniformly and can conform more readily to the bore. The SS-50U is easy to assemble on piston.

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Full chrome-faced side rails assure long ring life. Special treatment of these rails produces quick seating.

← BETTER OIL CONTROL
assured by uniform radial pressure. Full flow of oil back to crankcase obtained by maximum ventilation.

SIDE SEALING →

is assured by the proper axial pressure of rails against sides of groove. This provides smoke control under high vacuum conditions.



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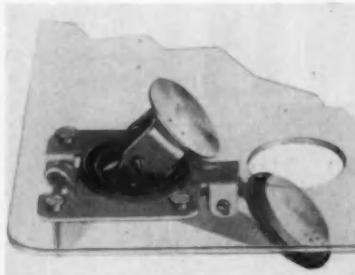
PRODUCTS

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FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Aircraft Flush Latch

Incorporating specially designed rubber gaskets, a flush aircraft latch is said to substantially improve latch sealing characteristics at access doors and panels. Fuel-resistant rubber gas-



kets surrounding both the "push" and handling buttons are self-sealing for pressure and moisture resistance purposes.

Designated the Series 1100 flush latch, the over-center toggle action is claimed to offer positive locking with minimum deflection under load. Weighing only one ounce, it is available for various door and offset thicknesses and to match contoured surfaces. For high-temperature conditions, silicon rubber gaskets are employed. *Missile-Air*.

Circle 60 on postcard for more data

Solder Resist

Masking of printed circuits for controlled soldering, permitting selective soldering and minimizing bridging-over, is said to be obtained with a material known as PC No. 33 solder resist. An organic coating which affords insulating resistance across the circuit pattern, it has a low temperature cure of 200 F and requires a cure time of 20 to 30 min. The film it deposits is resistant to peeling, pitting or blistering, and will not break down, it is claimed, at solder pot temperatures up to 650 F with immersion of 10 to 15 sec.

The material can be applied by screening onto certain areas of the circuit to mask out solder take, while

other areas are left uncoated to permit soldering. Recommended procedure calls for screening circuits with a 165 mesh stainless steel screen or the equivalent silk screen, after which they are cured at 200 F. Regular assembly, fluxing and soldering can proceed after the circuit cools. *London Chemical Co., Inc.*

Circle 61 on postcard for more data

Cold-Punch Laminate

Designed particularly for printed circuit applications, Textolite cold-punch 11572 is a low-cost, paper-base plastic laminate recommended by the company for electronic applications using high voltage at radio frequencies. It is available with one or two ounce copper on one or both sides, or in the unclad form. One feature is its ability to withstand exposure to common decreasing solvents used in printed circuit processes. The material is said to offer insulation resistance of 100,000 megohms after 96 hrs at 96 per cent relative humidity. Electrical properties are stated to exceed standards set by NEMA for an XXX-P grade, and to meet property requirements set by military specification MIL-P-3115-PBE-P.

Punching cleanly at normal room temperatures, in thicknesses up to $\frac{1}{8}$ -in., the cold fabricating quality of the material avoids dimensional changes resulting from combined heat and punching stresses. Other cited features include high flexural strength, low power factor, high heat resistance, and low moisture absorption. *General Electric Co.*

Circle 62 on postcard for more data

Thermocouple

Developed specifically for sub-surface temperature measurements, a spring-loaded thermocouple is said to give constant contact and accurate measurement. In the new line, designated Type J, the spring (made of Inconel-X) holds the couple tip firmly against the work surface. It is stated to be especially suited for tempera-

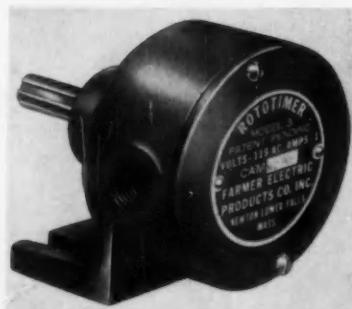
ture measurement of plastic extrusion machines, generator bearings and dynamo end plates, typical of applications where the measured part may tend to break contact with the thermocouple.

The device is available as a straight or 90-deg angle type. It also comes optionally equipped with a bayonet adapter allowing easy removal for inspection and re-insertion. *Minneapolis-Honeywell Regulator Co.*

Circle 63 on postcard for more data

Synchronous Contactor

The Model 3 Rototimer was reportedly developed to provide a low-cost rugged synchronous switch for use in such applications as punch press control, magnetic counter actuation, shaft synchronization, and register control. It is primarily for applications where the operate point is care-



fully set and infrequently changed. The operate point of the switch is adjustable in five degree steps by resetting the cam. Fine adjustment is made by means of an eccentric screw that opens or closes the gap between the standard automotive distributor points, with contacts rated one ampere non-inductive at 125-v ac. Four types of interchangeable cams are available to vary switching functions.

Overall size of the Model 3 Rototimer is 4 17/32 in. long, 3 1/2-in. diam, 3 9/16 in. high. Coupling to controlled equipment is made with a 1/2-in. diam shaft having a 1/8-in. keyway. *Farmer Electric Products Co., Inc.*

Circle 64 on postcard for more data

Stacked Spring Washers

Now being offered are "energy cartridges" consisting of pre-assembled stacks of multiple Belleville spring washers held together by pins or rivets passing through the washers at or near their neutral axis. The cartridge provides a compact unit which can be incorporated as a one-piece component in the final product, and as such is easier to handle and install than loose washers. It can be preloaded so that only a very slight additional compression force is necessary to assemble the unit. Larger stacks of washers can be employed than was feasible with separate elements. The three-point (or more) loading of the cartridges is said to prevent buckling of the stacks.

Possible applications for these car-



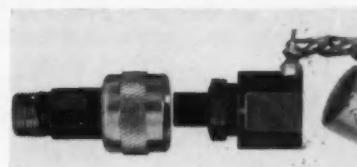
tridges, as pointed out by the company, are: As a shock absorber, in vibration-isolation mounts for such products as airborne electronic equipment, in aircraft, missiles, and ordnance projectiles; and in machinery such as impact presses. To exert large amounts of force within a limited range of deflection, in such products as die springs. To exert force at a low rate, i.e., a very small increase in load in proportion to the increase in deflection, such as in clutches, machine tool chuck and spindle drives, etc. To maintain reasonably constant pressure in spite of expansion due to temperature variations, such as in face-type seals for steam pumps. *Associated Spring Corp.*

Circle 65 on postcard for more data

Quick-Connect Coupling

Rated at 5000 psi, a quick-connect coupling for high-pressure hydraulic lines is self-sealing and leakproof, according to an announcement of its introduction. A few turns of the threaded female union coupling ac-

tuates two spring-loaded pins to open or close the connection. When the coupling is disconnected, an attached



dust cap protects the threads and keeps the connection free of dirt and damage. *Wisconsin Hydraulics, Inc.*

Circle 66 on postcard for more data

Special Tire

First deliveries of a tire engineered especially for the Cadillac Eldorado Brougham were recently announced. Although it is a 15-in. tire, the U.S. Royal 140, as it is called, is said to lower height of the car more than a present-day 14-in. tire would. The tire is claimed to incorporate advances in ease of handling, stability and quietness. Construction is tubeless, with four plies of rayon cord. It has a one-inch wide white sidewall. *United States Rubber Co.*

Circle 67 on postcard for more data

Gear Pump Design for Low-Cost Manufacture

A gear pump design that lends itself to low-cost manufacturing techniques has been unveiled. Suitable for fluid pressures up to 200 psi, it is said to be adaptable to applications such as engine oil pumps, pumps for automatic transmissions, and pumps for machine tool mechanisms.

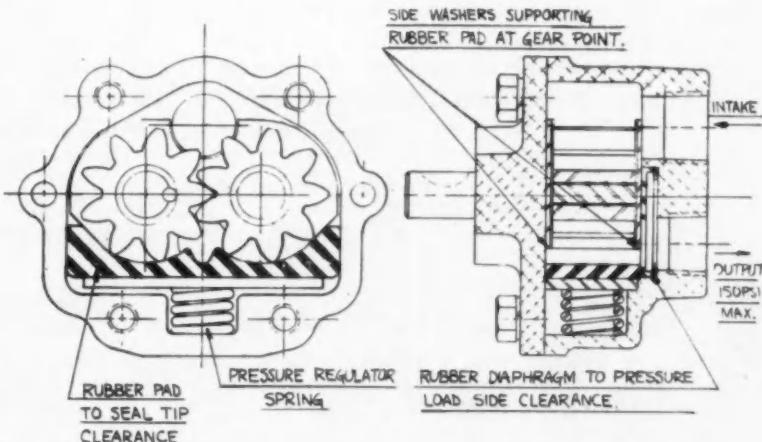
Typical arrangement for the basic version, as illustrated, consists of two conventional gears mounted on shafts in a simple housing. A stated feature of the design is that the mating gears may be mass-produced without close tolerances or fine tooth finish. Similarly, the housing cavity can be used practically as cast, without machining or profiling around the periphery. Three primary elements are said to constitute the heart of the design. The first is a molded synthetic rubber element which conforms with zero clearance to the gear teeth along the pressure outlet side of the pump. Secondly, a calibrated spring is installed as shown to control the action of the tip clearance pad. This, in effect, serves as a pressure relief valve. The third element is a molded synthetic rubber diaphragm installed

under the two gears, which is inflated by fluid pressure and takes up clearance between the upper and lower faces of the gears.

Performance characteristics are indicated by the following reported tests: Using a small pump with gears 1 1/2-in. diam, and employing SAE 20 oil at 180 F, the unit delivered a flow of 12 gpm at 60 psi at a speed of 2200 rpm. When the temperature level was raised to 250 F, the flow increased about 0.3 gpm under the same conditions. The operation of the pump with respect to flow versus pressure, and using a constant speed of 2200 rpm, showed flow ranges from 13.3 gpm at 10 psi, to 12.1 gpm at 60 psi, with 180 F oil.

It is noted that the pump illustrated is only one of a number of similar designs; and that the housing, gears and molded control elements can be modified to suit specific applications. Mention is also made that work is under way to develop versions suitable for high-pressure applications, between 1000 and 3000 psi. *New Products Corp.*

Circle 68 on postcard for more data



News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Continued from Page 39

Extensive Program Scheduled for Plant Maintenance Event

Sixty-two of the nation's foremost experts in keeping the nation's factories running will lead discussions at the Plant Maintenance & Engineering Conference at Cleveland's Public Auditorium in January. The conference will be held in conjunction with the Plant Maintenance & Engineering Show during the first three of the four-day run of the show, Jan. 28 to 31, 1957.

Maintenance procedures for every type of industry will be described in the sessions, and thousands of products will be demonstrated by 400 exhibiting companies. Special conference sessions will be devoted to such industries as metalworking, metal fabricating, petroleum, steel, and rubber.

Rubber Industry Sales Seen Booming to New Peak in 1957

The rubber industry will chalk up record sales of \$6 billion in 1957 and reach an annual rate of \$7 billion by 1960. Such were the predictions of H. E. Humphreys, Jr., president of U. S. Rubber Co., in New York City recently.

Speaking at a press preview of the company's new exhibit hall in Rocke-

feller Center, Mr. Humphreys also disclosed that U. S. Rubber plans to spend a record \$40 million for expansion and modernization next year. The 1957 outlay will bring the company's capital expenditures over the last 10 years to \$260 million.

Displays in the new exhibit hall dramatize the role of the company's 33,000 products in modern life. One highlight is a "phantom" car with body sections removed to show the nearly 100 products made by U. S. Rubber for the automobile industry.

Chevrolet Cites Growth Of 33-Year-Old Facility

The substantial growth of the Chevrolet assembly plant at Norwood, O., was cited recently as the three millionth vehicle came off the lines there. Established in 1923, the plant last year paid out about 15 times as much money to local supplier firms and employees as it did in its first year of operation. The expenditures totaled \$8.7 million compared with \$582,000 in 1923.

Today, the plant employs approximately 1700 persons, more than twice as many as it did in 1923. Floor space has been nearly doubled in the intervening years to more than 510,000 sq ft.

In its first year of operation, the Norwood plant turned out 17,585 vehicles. Production last year totaled 194,379 units.

Sales of Chemicals in 1957 To Reflect High Car Output

The 1957 automobile production year will have a healthy effect on the sales of chemicals, according to A. T. Loeffler, vice-president of Food Machinery & Chemical Corp. Speaking before a recent National Industrial Conference Board meeting, he noted that such chemical process industries as rubber, glass, and textiles, will show increased sales as a result of booming activity in the automobile field.

Mr. Loeffler went on to say that, in addition to chemicals needed in the manufacture of cars, chemicals will be needed during 1957 in increasing amounts in the maintenance of automobiles. Specialties such as antifreeze, tetraethyl lead, dyes used in tetraethyl lead, ethylene dibromide, and ethylene dichloride will probably reach sales of \$350 million in 1957.

Chrysler Stamping Plant Starts Output In February

The first of 260 presses was installed last month at Chrysler Corp.'s Twinsburg, Ohio, stamping plant. It is expected that 8 of the 28 major press lines will be in operation by February, although the overall building project will not be completed until next summer. When in full production, the plant will employ 3500 workers.

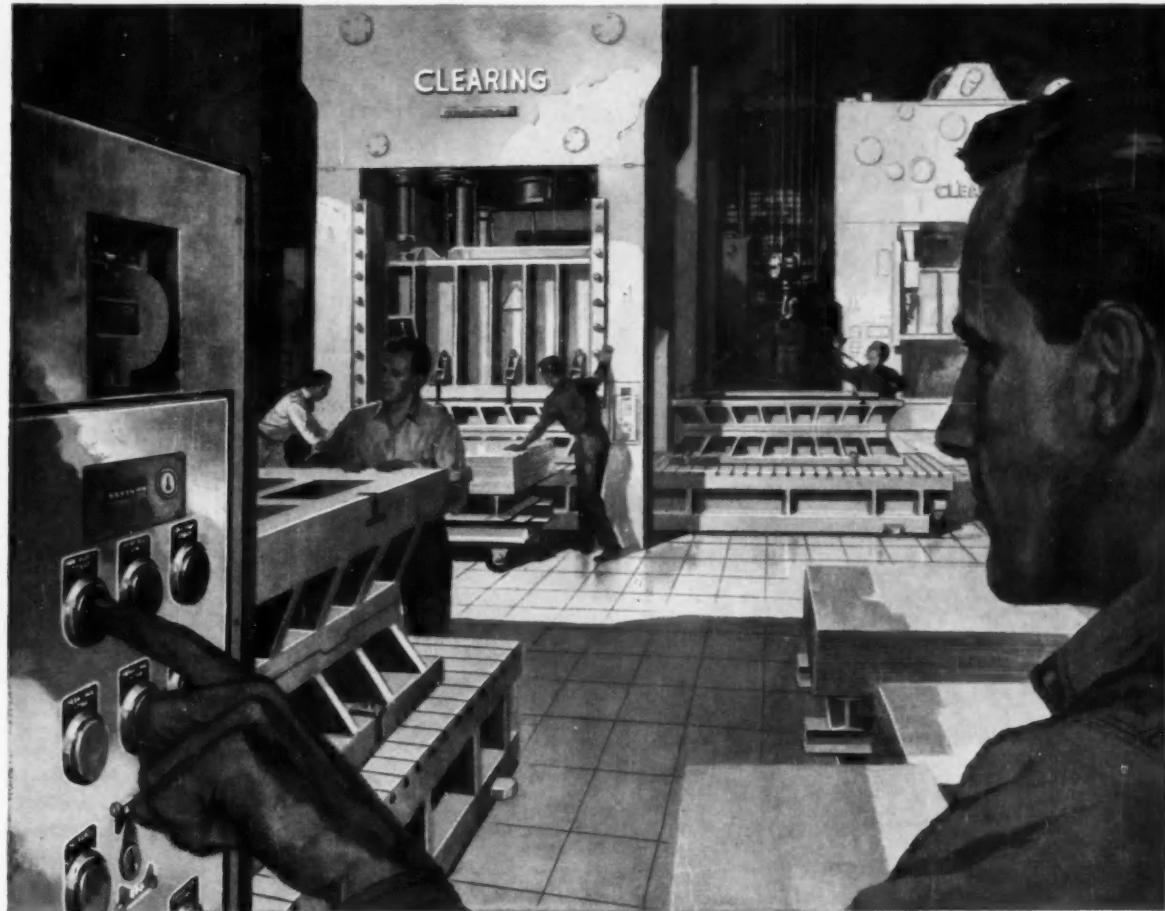
(Turn to page 192, please)

FIGURES FOR 10 MONTHS SHOW SALES OFF BY MILLION OVER SAME PERIOD OF 1955

Regional Sales of New Passenger Cars

Zone	Region	October			Ten Months		Per Cent Change		
		1956	1956	1955	1956	1955	Oct. over September	Oct. over Oct. 1955	Ten Months over 1955
1	New England	24,423	22,807	29,742	287,890	335,648	+ 7.09	-17.88	-14.54
2	Middle Atlantic	61,253	77,938	109,582	960,571	1,149,824	+ 4.26	-25.88	-16.44
3	South Atlantic	57,207	55,647	70,497	689,053	746,301	+ 2.79	-18.81	-11.70
4	East North Central	98,840	98,535	138,480	1,222,266	1,522,538	+ .32	-28.60	-19.61
5	East South Central	98,894	19,238	32,227	247,470	302,431	+ 8.11	-35.37	-11.17
6	West North Central	53,813	35,214	52,424	434,416	529,010	-11.52	-35.50	-17.87
7	West South Central	41,164	42,489	55,693	464,446	555,287	-3.12	-26.09	-16.81
8	Mountain	14,014	16,050	19,201	187,706	194,588	-12.60	-27.01	-13.94
9	Pacific	52,604	50,105	68,160	591,861	701,909	+ 5.39	-22.54	-15.68
Total—United States		424,414	421,021	576,045	5,037,239	6,041,768	+ .81	-26.32	-16.63

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt. Zone 2—N. J., N. Y., Pa. Zone 3—Del., D. C., Fla., Ga., Md., N. C., S. C., Va., W. Va. Zone 4—Ill., Ind., Mich., Ohio, Wis. Zone 5—Ala., Miss., Tenn. Zone 6—Iowa, Kan., Minn., Mo., Neb., N. D., S. D., Zone 7—Ark., La., Okla., Tex. Zone 8—Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo. Zone 9—Cal., Wash.



Imagine! Presses where dies are changed the way you turn on the light!

Here's an arresting new method to put more productive hours into a working day. Clearing moving bolster presses shrink the hours required from changing jobs on a press, or a press line, to minutes. Push-button die setting reduces downtime in direct proportion to the amount of job changing required in a plant—saving up to 50% of lost production hours in some instances.

These new Clearing presses are designed with a bolster that is rolled from left to right through the die area. Dies for the next job are set up outside the press during a press run. When the current job is completed, a touch of the control button powers the new dies into

position under the slide. Power actuated clamps release the old dies, clamp in the new—and with proper slide adjustment (also powered) the new job is ready to go.

Clearing engineers have designed these presses to combine with other bold new ideas for increasing press productivity. Moving bolsters will work, for example, with Transflex feeds. They may also be designed on either top drive or bottom drive machines. If this unusual new idea in press design appeals to you, remember it is only one of many Clearing innovations that can help you boost manufacturing output. Call on a Clearing engineer to discuss these ideas. There'll be no obligation, of course.

CLEARING PRESSES

CLEARING MACHINE CORPORATION

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Division of U. S. INDUSTRIES, INC. 



AIR BRIEFS

By RALPH H. McCLAREN

Record Year for Air Transportation

Scheduled intercity air transportation in the U. S. increased 13.7 per cent in 1956 over 1955 while railway passenger miles decreased 0.5 per cent and motor bus passenger travel decreased 4.5 per cent. Thus for common carrier passenger miles the airlines alone were responsible for an overall intercity travel increase of 3.1 per cent. These figures are based upon an actual 10 months experience with the remaining two months of 1956 estimated.

Note that private automobile travel at an estimated 621 billion passenger miles is almost 10 times greater than the total of 61 billion passenger miles for all common carriers.

Air passenger revenues reached \$1,537,042,000 in 1956, a gain of 12.7 per cent over 1955 and the number of passengers carried increased 12.8 per cent to a total of 47,015,000 for 1956.

Public service revenues or subsidy to the airlines amounted to \$35,614,000 in 1956, an increase of 4.4 per cent over the 1955 subsidy.

Air travel for 1957 should increase about the same

Estimated Intercity Common Carrier Passenger Miles for 1956

(All Data in Thousands)

	1956	1955	Per Cent Change
Scheduled Airlines:			
First Class.....	14,602,000	13,025,000	12.1
Coach.....	7,853,000	6,717,000	16.9
Total.....	22,455,000	19,742,000	13.7
Class I Railway:			
First Class.....	6,407,000	6,441,000	0.5 D
Coach.....	17,219,000	17,314,000	0.5 D
Total.....	23,626,000	23,755,000	0.5 D
Motor Bus.....	15,747,000	16,439,000	4.5 D
Common Carrier—Total	61,828,000	59,986,000	3.1
Private Automobile.....	621,000,000	585,800,000	6.0

Sources: Official CAB and ICC Reports.

D—Decrease

percentages over the 1956 figures. In preparing for the future, and to offer faster and more comfortable service, the air transportation industry has instigated the largest procurement program in its history. Present time figures indicate orders for:

213 pure jet transport planes costing \$1,211,750,000.
183 turboprop airplanes costing \$460,000,000.

271 piston-engined airplanes costing \$504,925,000. These figures were released by the Air Transport Association of America.

Aeronautical Science's 25th Annual Meeting

The Institute of the Aeronautical Sciences will hold its 25th annual meeting January 28-31 at the Sheraton-Astor Hotel, New York. A record of 94 technical papers will be delivered by engineers, designers and technical specialists during the four days.

Registration is expected to exceed the 2179 who registered at the 1956 annual meeting. Honors night dinner is scheduled for January 28. Edward P. Curtis, Special Assistant to President Eisenhower for Aviation Facilities Planning, will be guest of honor and principal speaker.

Mundy I. Peal, president of Republic Aviation Corp., will be installed as the new president of IAS. He succeeds Edward R. Sharp, director of the NACA Flight Propulsion Laboratory.

New All-Weather Jet Interceptor Makes First Flight

On December 26 the F-106A delta-wing interceptor made its first flight at Edwards Air Force Base, Calif. It was piloted by R. L. Johnson, chief engineering test pilot for Convair, maker of the advanced design interceptor for the U. S. Air Force. Equipped with the latest electronic fire control system and armament, the F-106A can seek out and intercept attacking bombers in any kind of weather, day or night. It is designed to operate at altitudes up to and above 50,000 ft.

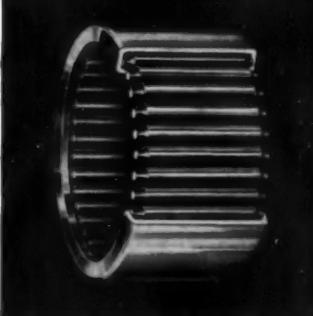
Construction of the new jet plane and subsequent models is being accomplished for the Air Force under an initial contract of \$83,000,000 by Convair, a division of general Dynamics Corp.

Nuclear Propulsion Studied by Marquardt

Marquardt Aircraft Corp. of Van Nuys, Calif., has been designated by the Air Force as a prime contractor (Turn to page 168, please)

**TORRINGTON NEEDLE BEARINGS
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- low coefficient of starting and running friction
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- unequaled radial load capacity
- low unit cost
- long service life
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- permits use of larger and stiffer shafts



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Torrington's experience with Needle Bearings spans the history of their development for thousands of successful applications. In seeing that you get every last ounce of performance these unique bearings can deliver, your Torrington representative is an expert: call on him at any time. *The Torrington Company, Torrington, Conn.; South Bend 21, Ind.*

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The BUSINESS PULSE

Industrial Production, Employment, Personal Income, and Consumer Spending for 1956 Set New Records. Current Predictions Reflect Moderate Optimism; Consensus Is that Gross National Product Will Achieve New High in 1957

This Survey is Prepared
Exclusively for AUTOMOTIVE
INDUSTRIES by the Guaranty
Trust Company of New York

It is impossible to sum up or characterize economic developments during 1956 with any simple phrase inasmuch as the year was featured by mixed performance. Some trends were favorable and others questionable, and it is difficult to determine at this time which carry more portent for the future.

On the obviously favorable side, a number of new records were set. Industrial production averaged higher than ever before, as did employment and personal income. Spending by consumers rose to a new peak. These gains were sufficient to carry gross national product—which is the measure of all goods and services produced—to a new all-time high of approximately \$411 billion, 5 per cent more than in 1955.

Productivity Rate

Over against these things, however, there were some other occurrences during 1956 of a decidedly less reassuring nature. These are now casting some doubt over the future.

To begin with, there seems to have been a rather significant decline in the rate of increase in productivity. It is true that no very reliable statistical information is available in this area, but most analysts are agreed that a decrease in the rate of productivity gain has occurred. And since this took place at a time when there was no slackening whatsoever in the demand for wage increases, the consequence was that labor costs per unit of output tended to rise, thus threatening the profit position of business.

In this situation, businessmen felt obliged to make compensatory increases in the prices of their products. These upward price pressures were reinforced by pressures from other sectors of the economy. Prices of consumer food items, for example, moved higher, reflecting among other things a reversal of the long decline in the prices of farm products. And

of course still other price pressures were inherent in the situation of full employment which prevailed. Thus, 1956 saw inflation, with all of its attendant evils, emerge again as a national problem.

This necessitated the maintenance of tight-money conditions by Federal Reserve authorities. But the attempt of monetary officials to restrict the availability of credit, coupled with rising competition at the retail level, made it difficult for business firms in many instances to pass along higher costs by raising the prices of their products. Thus, the threat to profit positions materialized into hard reality. Corporate profits declined successively in the first, second, and third quarters of the year, and for the latter period—when the steel strike was an additional depressant—they totaled \$40 billion at a seasonally adjusted annual rate, 14 per cent below the annual rate in the final quarter of 1955.

Business Investment

Since profits are the mainspring of a free competitive economy, a decline of this magnitude has sobering implications. A continuation of the down-trend would most certainly raise questions as to whether plant and equipment expenditures, which have been such a conspicuous feature of the boom, would continue to expand very far into the future. Indeed, it may be of some significance that the latest surveys of business investment intentions seem to indicate that the rate of gain for this type of outlay is even now tending lower. The Commerce Department, for example, reports that the expected increase in business investment in the first quarter of 1957 is the smallest in two years.

Furthermore, while consumer spending rose in 1956, the increase was not particularly large. Sales inched upward to new highs; they did not soar. For the first 11 months of the year, the dollar value of retail trade was about 3½ per cent larger than in the comparable period of 1955, but in "real" terms the gain was probably a good deal less, owing to the price increases which occurred. This performance raises additional questions about the future of investment expenditures, since if only modest gains are occurring in retail sales, it is logical for business-

(Turn to page 116, please)

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CLEVELAND Garco Machinery, Inc.	HOUSTON Oliver H. Van Horn Co., Inc.	MONTREAL F. F. Barber Mach'ry Co.	ST. LOUIS Wm. Scheer Company
DALLAS Harrer Machine Tool Co.	INDIANAPOLIS Otto Machinery Co.	NEW ORLEANS Oliver H. Van Horn Co., Inc.	SYRACUSE J. F. Owens Mach'ry Company
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FT. WAYNE Otis Machinery Co.			

Cemented Carbide Dies for Hot Heading Titanium Bolts

Various configurations produced in titanium bolts through hot heading operations with Carboly grade 190 carbide dies.



A PRODUCTION increase of roughly 16 times, and bolts of better physical properties finished consistently to final size has been accomplished by the use of cemented carbide dies in hot heading titanium aircraft bolts. According to Voi-Shan Mfg. Co., Culver

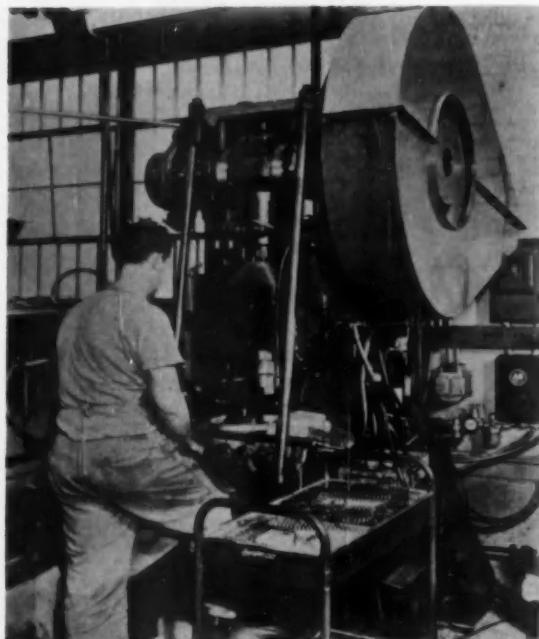
City, Calif., which processes fasteners for both aircraft frames and jet engines, application of the carbide dies boosted production from 150 to better than 2500 bolts per hour by providing greater resistance to wear, and eliminating galling. Although the company uses cold heading in upsetting its steel alloy bolts, all of its titanium and some of its stainless steel bolts in larger sizes are hot forged in order to obtain the maximum in physicals.

In hot heading, titanium of the RC 130 series is used. The material, in the form of cut-off blanks, is placed in the coil of an induction heater and heated to around 1500 F for about 3 seconds. The die itself is not normally preheated.

Temperature of the induction heater is controlled carefully since excessive temperature results in grain growth and other detrimental effects. Insufficient temperature produces incipient or open internal or surface cracking.

Following heating, the blanks are inserted, one at a time, into the die of an open-head machine. The operation is almost semi-automatic since the operator trips the press to form the desired configuration and eject the bolt, while he inserts another blank in the induction heater. Both 60 and 85-ton mechanical, and 60-ton hydraulic presses are used.

Before shifting to carbide dies, the company reports, it experienced considerable difficulty with steel dies. Today, its special precision-built Carboly grade 190 cemented carbide dies provide as many as 50,000 of the larger size bolts before any signs of wear show up. Previous dies wore after upsetting only 3000 bolts. The carbide dies perform even better on smaller diameter bolts, producing as many as 100,000 as against 5000 previously. In a 100,000 run, the dies are removed about 10 times for repolishing.



One of the 60-ton presses employed to hot forge titanium aircraft bolts at the rate of 2500 per hour. View shows Carboly grade 190 carbide die in open-head machine, and induction heater near operator's left shoulder.



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Two-spindle, rotary-table Mattison surface grinder, working on connecting rods in plant of American Motors, Kenosha, Wis.

MULTIPLE-SPINDLE rotary surface grinders are used to advantage for practically all types of surface grinding, but nevertheless have their greatest advantage on workpieces where surfaces being ground have a relatively short dimension in one direction or the other. The principle on which the abrasive wheels on these machines operate is such that less clearance is available for metal cuttings over large-area flat surfaces.

Where surfaces involved have at least one short dimension, metal cuttings need be carried only a comparatively short distance before they find clear-

Grinding Connecting Rods on Rotary-Table Machines

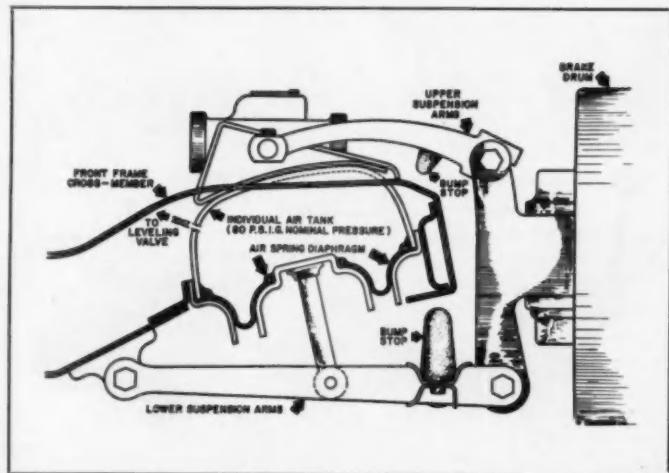
ance and release. Among the many different types of workpieces particularly suitable for handling on grinders of this kind, a large proportion are found in automobile manufacturing. An outstanding instance is the surfacing of connecting rods, in connection with which many such machines are found at work in various plants over the country.

An interesting case in point is found at the plant of American Motors, Kenosha, Wis., where a rotary-table, two-spindle Mattison grinder has its table fitted with suitable fixtures to hold connecting rods being ground. In fact, two such machines are used. The first is employed for rough grinding both sides of the drop-forged connecting rod, with the cap attached. Then, after all drilling, broaching, nut and bolt insertion, cap parting and re-assembly have been completed, a second, similar machine is used for finish grinding both sides of the rods.

Where rotary-table grinders of this type are used, there is always the possibility of choosing between a cylindrical type of grinding wheel and a segmental wheel. Generally, the segmental wheel is preferable for rough grinding, because the large openings between sections allow free flow of coolant to the cut. Where a job demands exceptionally close tolerance, however, or where the finish must be extremely fine, the cylindrical wheel should be employed. The grinder employed for finishing on connecting rods at American Motors is equipped with two 20x4x16-in. cylinder wheels, and each of the two spindles is powered by a 30 hp motor.

Construction of the U. S. Rubber Co. AIR SPRINGS

This schematic illustration shows construction of the new passenger car air spring made by United States Rubber Co. It is now used on the Cadillac Eldorado Brougham (See *AI*, Dec. 1 and Dec. 15, 1956). As load conditions of the car change, the rubber and nylon diaphragm moves upward or is pushed downward. A system of valves, together with an air compressor and an accumulator, are other components of the new suspension. No coil springs are used at the front suspension nor leaf springs at the rear.





Built to Span the Years—

POWER SPRAY WASHERS

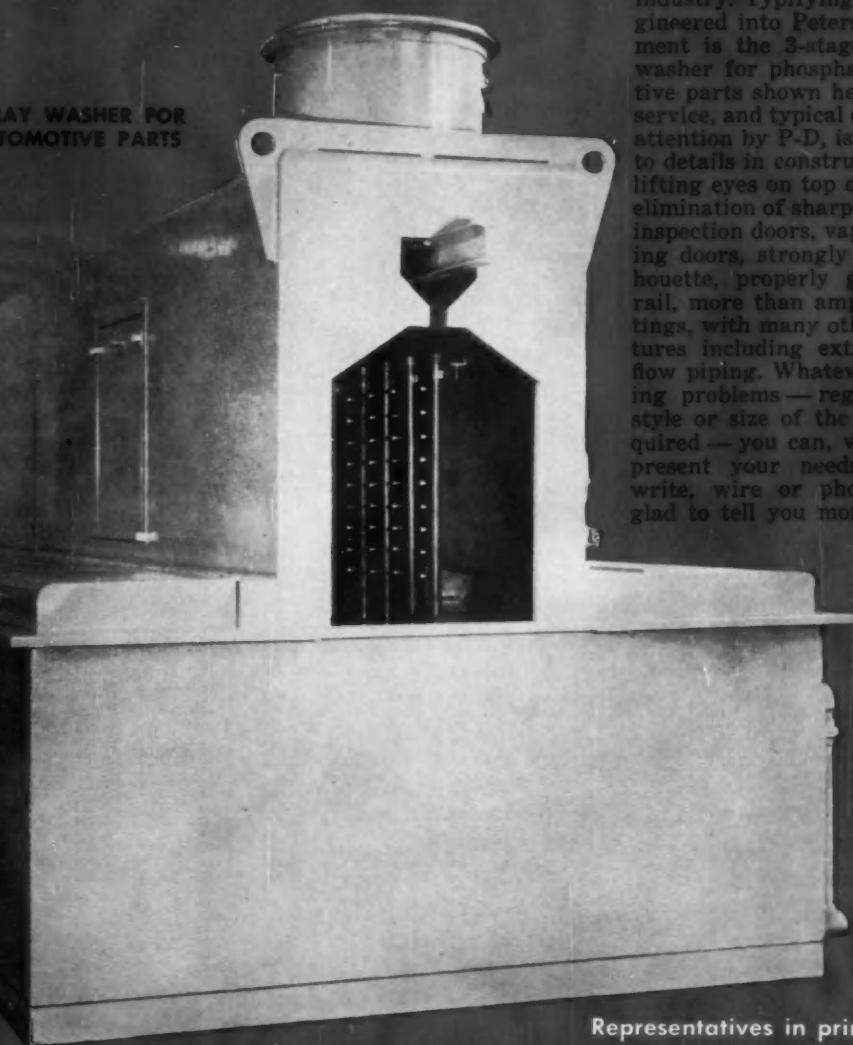
by PETERS-DALTON

Quality of construction is most important to consider when selecting equipment, particularly that used for high production runs. Efficient operation and dependable service can be had only when this equipment is manufactured to endure, and is correctly installed.

For more than a quarter century Peters-Dalton has been designing, engineering and building power spray washers, paint finishing systems, baking and drying ovens, air make-up systems, and dust collection systems. They have consistently met the needs and production requirements of

industry. Typifying the details engineered into Peters-Dalton equipment is the 3-stage power spray washer for phosphatizing automotive parts shown here. A standard service, and typical of the thorough attention by P-D, is the care given to details in construction. Note the lifting eyes on top of the machine, elimination of sharp corners, ample inspection doors, vapor type charging doors, strongly reinforced silhouette, properly guarded monorail, more than ample exhaust fittings, with many other special features including extra large overflow piping. Whatever your finishing problems — regardless of the style or size of the equipment required — you can, with assurance, present your needs to us. Just write, wire or phone — we'll be glad to tell you more.

3-STAGE POWER SPRAY WASHER FOR
PHOSPHATIZING AUTOMOTIVE PARTS



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- PD Industrial Washing Equipment
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Average 1957 Automobile Will Use 38.1 Lb of Aluminum

AMERICA'S average 1957 model passenger car, breaking all previous records, utilizes 10 per cent more aluminum than '56 models. Based on this figure, the automobile industry will use 23.5 per cent more aluminum in 1957 than actually used in '56. The increase was revealed in the second annual survey report by Aluminum Co. of America at the SAE Annual Meeting in Detroit. Aluminum usage in the average passenger car has climbed from 29.6 lb in 1955 cars to 34.6 lb in 1956 to 38.1 lb in 1957 models. One model alone, the Cadillac Brougham, utilizes more than 255 lb of the light metal. Thus, the survey indicates an all-time high of 247.5-million lb of aluminum will be used in passenger cars this year if these are produced at an estimated annual rate of 6.5 million cars. Reporting on the survey, Harry L. Smith, Jr., vice president of sales development and market research for

Alcoa, stated the 38.1 lb figure is in keeping with Alcoa's long-term estimates. Trim uses, which have increased almost 100 per cent since only last year, now account for 13.2 per cent of the aluminum in the average car. Based on three typical low price and three typical medium price cars, the following is the percentage of total aluminum weight per car by application (100% = 38.1 lb):

Engine	32.6 per cent
Automatic Transmission	41.1 per cent
Power Steering and Brakes	7.3 per cent
Hardware and Trim	13.2 per cent
Other	5.8 per cent

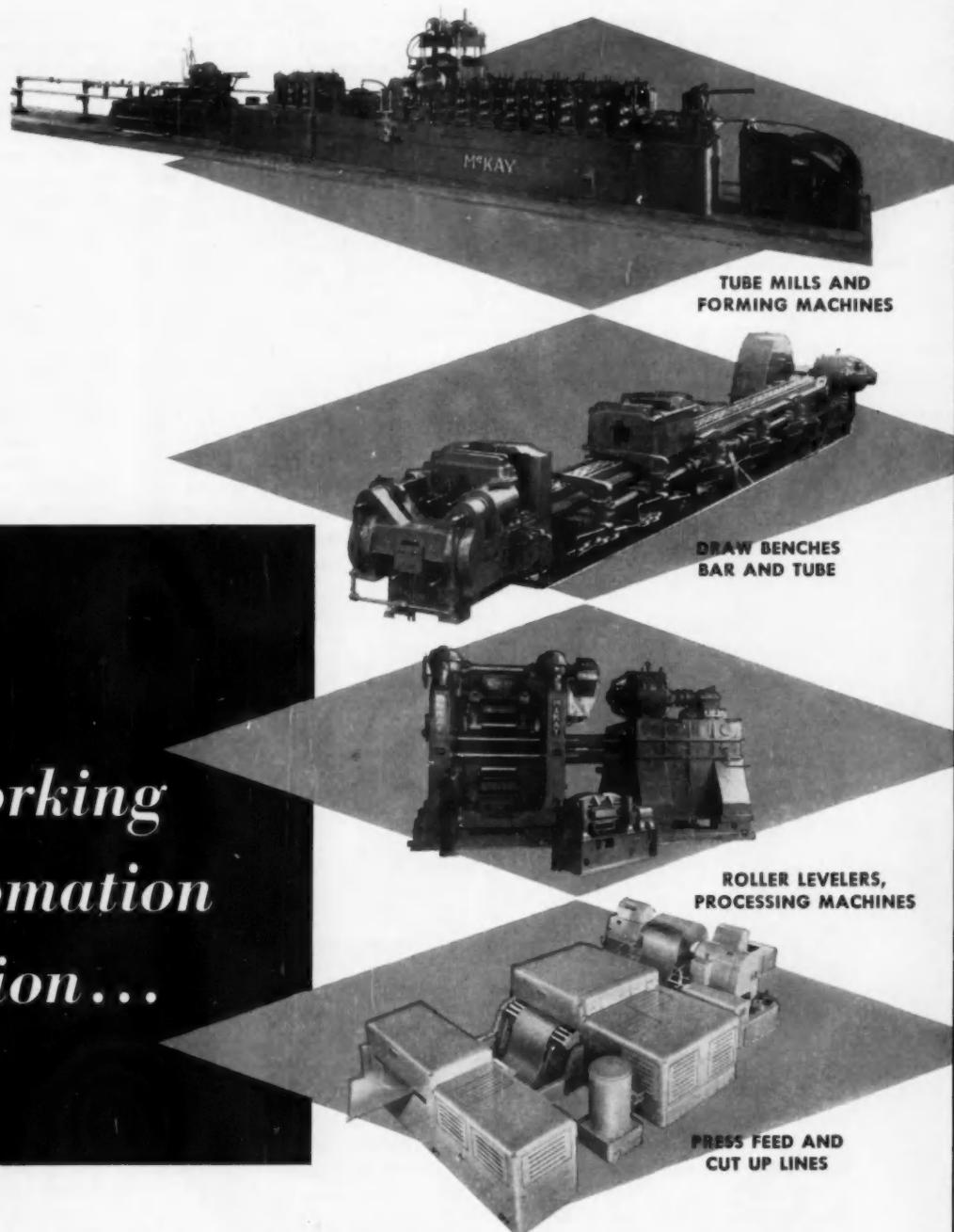
New models average 17.7 lb of aluminum die castings per car as compared to 15.7 in '56 models and 12.3 lb in '55 models.

APPLICATION OF ALUMINUM (BY CAR) ON AN ESTIMATED 1957 PRODUCTION OF 6,500,000 PASSENGER CARS BASED ON 1956 PRODUCTION PERCENTAGES

CAR	Production (Per Cent of Total)	Estimated Production (Cars)	Estimated Production (Cars)	Aluminum Usage (Pounds)	Automatic Transmission		Estimated Production (Cars)	Aluminum Usage (Pounds)	Combined Total
					Estimated Production (Cars)	Aluminum Usage (Pounds)			
Chevrolet 6	11.67	785,550	285,493	18.03	424,788	22.44	68,260	23.84	15,468,486
Chevrolet V8	10.80	1,092,000	382,200	20.37	611,520	28.78	95,280	29.20	26,941,278
Pontiac	5.85	380,250	19,012	15.42	247,163	36.42	114,755	37.92	13,620,585
Oldsmobile	7.51	488,150	1,464	20.81	78,840	41.43	470,040	44.78	21,554,927
Buick	9.21	598,000	21,551	21.96	307,708	43.27	269,393	44.77	25,546,288
Cadillac	2.32	150,800	.....	.....	.....	.....	180,500	58.14	8,767,512
Eldorado	.07	4,500	.....	.....	.....	.....	4,500	199.14	306,087
Brougham	.01	850	.....	.....	.....	.....	650	255.84	166,186
Total GM	53.44	3,473,000	889,720	18.61	1,657,817	30.82	1,116,063	43.99	113,225,239
Ford 6	2.81	192,650	63,928	18.81	96,804	35.98	21,918	36.36	5,468,646
Ford V8	20.88	1,339,350	488,423	22.14	709,325	38.51	180,602	38.89	44,802,730
Mercury	4.21	273,650	24,628	23.19	180,609	44.06	68,413	44.56	11,577,239
Lincoln	.83	53,950	.....	.....	10,790	57.69	43,180	59.82	3,204,306
Continental	.02	1,300	.....	.....	280	66.57	1,040	68.70	86,756
Total Ford	28.48	1,849,900	556,979	21.78	997,788	40.19	295,133	43.73	85,142,677
Plymouth 6	2.30	149,500	48,289	18.17	89,251	52.56	11,960	68.54	6,364,262
Plymouth V8	5.35	347,750	112,323	27.18	207,607	61.58	27,820	75.86	17,930,457
Dodge 6	.24	16,800	1,560	14.98	9,380	54.59	4,880	68.57	855,239
Dodge V8	3.18	208,700	20,670	21.94	124,020	61.55	82,010	78.53	12,770,546
De Soto	1.74	113,100	.....	.....	45,240	83.28	67,880	97.26	10,387,651
Chrysler	1.46	96,200	.....	.....	28,860	91.87	67,340	105.85	9,779,307
Imperial	.32	20,800	.....	.....	.....	.....	20,800	129.08	2,894,884
Total Chrysler	14.61	949,050	182,842	24.10	501,336	83.53	262,470	92.64	60,761,326
Nash	.32	20,800	.....	.....	16,040	57.38	4,160	58.98	1,200,160
Hudson	.13	8,450	.....	.....	6,760	61.06	1,690	62.68	518,930
Rambler 6	.78	50,700	12,675	36.25	30,420	53.36	7,605	54.96	2,500,651
Rambler V8	.58	37,700	9,425	42.63	20,735	53.84	7,540	55.44	1,936,178
Total AMC	1.81	117,650	22,100	38.97	74,555	55.09	20,995	56.55	6,155,819
Packard	.25	16,250	.....	.....	16,250	32.86	.....	.....	534,300
Studebaker Champ.	.27	17,550	7,020	10.24	10,530	14.24	.....	.....	221,832
Studebaker Comm.	.54	35,100	3,510	15.47	31,590	19.47	.....	.....	609,357
Studebaker Pres.	.09	38,350	1,910	15.57	36,432	19.57	.....	.....	742,937
Golden Hawk	.03	1,950	.....	.....	1,950	26.35	.....	.....	51,383
Total S-P Corp.	1.58	103,200	12,448	12.54	96,752	21.33	.....	.....	2,210,700
Grand Total	100.00	6,500,000	1,404,000	20.76	3,341,250	30.82	1,084,661	51.57	247,504,790

38.08 lb aluminum per 1957 car.

* Average car refers to composite car body model with aluminum weight distributed, but without automatic transmission, power brakes, or power steering.



Metal working Automation in action...

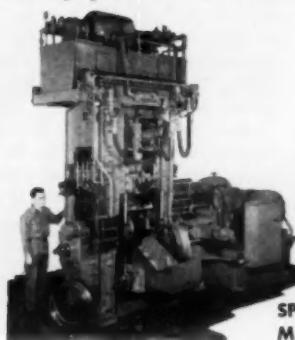
If you're in the metal working business, you should be acquainted with McKay automated lines available for many metal working operations.

McKay pioneered and has played a leading

role in the development of such equipment as that pictured on this page.

Basic McKay designs can be modified, or special machines developed to meet specific requirements.

THE MCKAY MACHINE CO., YOUNGSTOWN, OHIO



**SPECIAL
MACHINERY**



AIRCRAFT INDUSTRY Looks Forward

(Continued from page 59)

Force will be equipped with 137 modern wings of fighters, bombers and transports. The Navy's 17 carrier air groups, the Marine Corps' three air wings and Army Aviation also will be progressively modernized.

By the end of 1957, the USAF's Strategic Air Command will be equipped with several of its 11 sched-

uled heavy jet bomber wings and other USAF commands will operate still more supersonic fighters and interceptors of the "Century series." More powerful jet engines will leave production lines during the coming year. Several new guided missiles are currently ready for production and output will be started during 1957 for all three military services.

Commercial aircraft deliveries during the coming year will be almost completely limited to reciprocating-engine-powered types but the first U. S. production gas-turbine airliner

(a twin-engine turboprop for use by local service airlines) will be delivered by fall. Other jet and turboprop transport planes on order are not scheduled to be produced until 1958 and 1959.

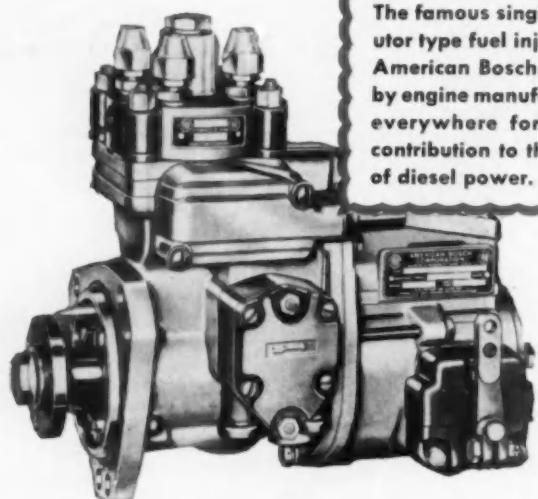
The aircraft industry is expected to top again the \$8.5 billion mark in sales for 1957, even though the total number of military units produced probably will continue to decline. Military output will probably approximate fewer than 7000 aircraft, but guided missile sales, continued production of heavier planes and increasing deliveries of commercial utility and airline aircraft will serve to maintain a high level of activity in the aircraft industry.

The industry's backlog of unfilled orders stood at \$18,363,000,000 on October 1, 1956, a substantial increase over the \$15,705,000,000 in orders on the books as 1956 began. Of the \$18,363,000,000 backlog, military orders accounted for \$12,822,000,000 up from the \$11,553,000,000 at the start of 1956.

Civil orders for airframes, engines, propellers and parts climbed from \$2,311,000,000 at the beginning of 1956 to \$3,520,000,000 at the end of the third quarter. And another category labeled "other aircraft parts and equipment" (which cannot easily be broken down between military and civil) went up from \$1,841,000,000 to \$2,021,000,000 during the same nine-month period. In other words, the backlog of civil orders during the nine months rose just about as much on the civil (\$1,209,000,000) as on the military (\$1,269,000,000) side.

The anticipated increase in Congressional military appropriations for air power for fiscal 1958 (the year beginning July 1, 1957) will enable the nation's aircraft industry to maintain moderately high production levels during calendar 1957 and beyond. However, there will be a substantial change in the proportion of aircraft and missile orders as time goes on. In 1958, military "aircraft and related procurement" ordering will probably be 65-35 in favor of manned aircraft, with the possibility that a 50-50 distribution of orders may come as early as 1961.

The aircraft industry, in an effort to keep the U. S. ahead of all potential enemies in air power, will continue to expand its research and development activities and facilities in 1957. The industry, which has invested more than \$1 billion of its own money for facilities, research and testing in the years since World War II, is planning to spend another billion for the same purpose in the next half decade.



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...for performance and outstanding service—that's the acknowledged record of more than 100,000 American Bosch pumps now in use.

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What's more—all American Bosch fuel injection products are backed by a growing system of authorized service agencies, fully equipped to provide quick, efficient repair service.

Unequaled value—for top diesel engine performance and economy of operation...long trouble-free life...lower maintenance expense—nothing equals a PSB fuel injection pump.



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with Automobile trim

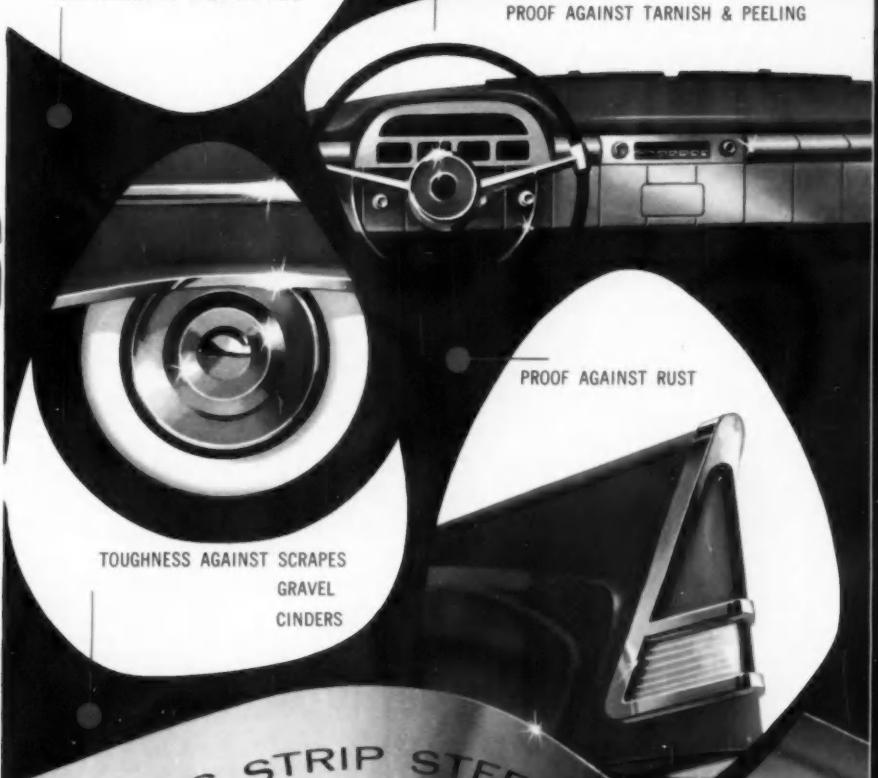
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On the showroom floor—on the highway—in and out of the used car lot—all the way to the ultimate owner, *stainless steel* pleases everyone! Stainless keeps selling itself because it's the metal that *does not deteriorate*. Always bright. Always beautiful. So easy to care for. So satisfying to find on your car.



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CARNEGIE, PENNSYLVANIA

Another Manufacturer Uses G-E Control



WE DON'T STOP WITH THE DELIVERY OF A CHEMICAL—

we put it to work and keep it working effectively

The chemical treatment of metals and metal parts—to prepare them for further processing, to protect them, to beautify them—has grown from a haphazard operation to a highly technical one. Supplying the chemical ingredients is a relatively simple job. Putting them to work and keeping them working effectively in your plant demands the skill of an experienced organization. We have that organization.

We supply not only the metal-treating chemicals, but also—free of charge—the technical and engineering service to keep them working at top efficiency. We furnish assistance in developing and installing the process, we maintain continuing inspection of the process and equipment if you so desire, we check samples of the processed metals in our Quality Control Laboratories—all these are part of the ACP service at your command.

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**Some of the many ACP
processes and chemicals
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of metals**

PAINT BONDING

Granodine® forms a phosphate coating base on iron and steel products—provides an excellent bond for paint, and greatly improves the corrosion resistance of the paint system.

Alodine® forms an amorphous film on aluminum which protects the metal and anchors the paint finish. Alodized aluminum meets service specifications.

Lithoform® promotes a good bond for paint on galvanized iron, zinc and cadmium plated surfaces. Also prevents any objectionable chemical reaction between applied paint film and the metal surface. One grade of Lithoform, in itself, provides excellent corrosion resistance on zinc and cadmium.

PROTECTION FOR FRICTION SURFACES

Thermoil-Granodine® forms a manganese iron phosphate surface which materially reduces wear and minimizes galling by eliminating metal-to-metal contact. It is particularly effective during break-in period of bearing surfaces.

RUSTPROOFING

Permadine®—a zinc phosphate coating chemical—forms a heavy oil-adsorptive crystalline coating on steel. Bonds paint or such rust-inhibiting oils as Granoleum®.

Thermoil-Granodine®—a manganese iron phosphate coating chemical—forms on steel a dense crystalline coating which, when oiled or painted inhibits corrosion.

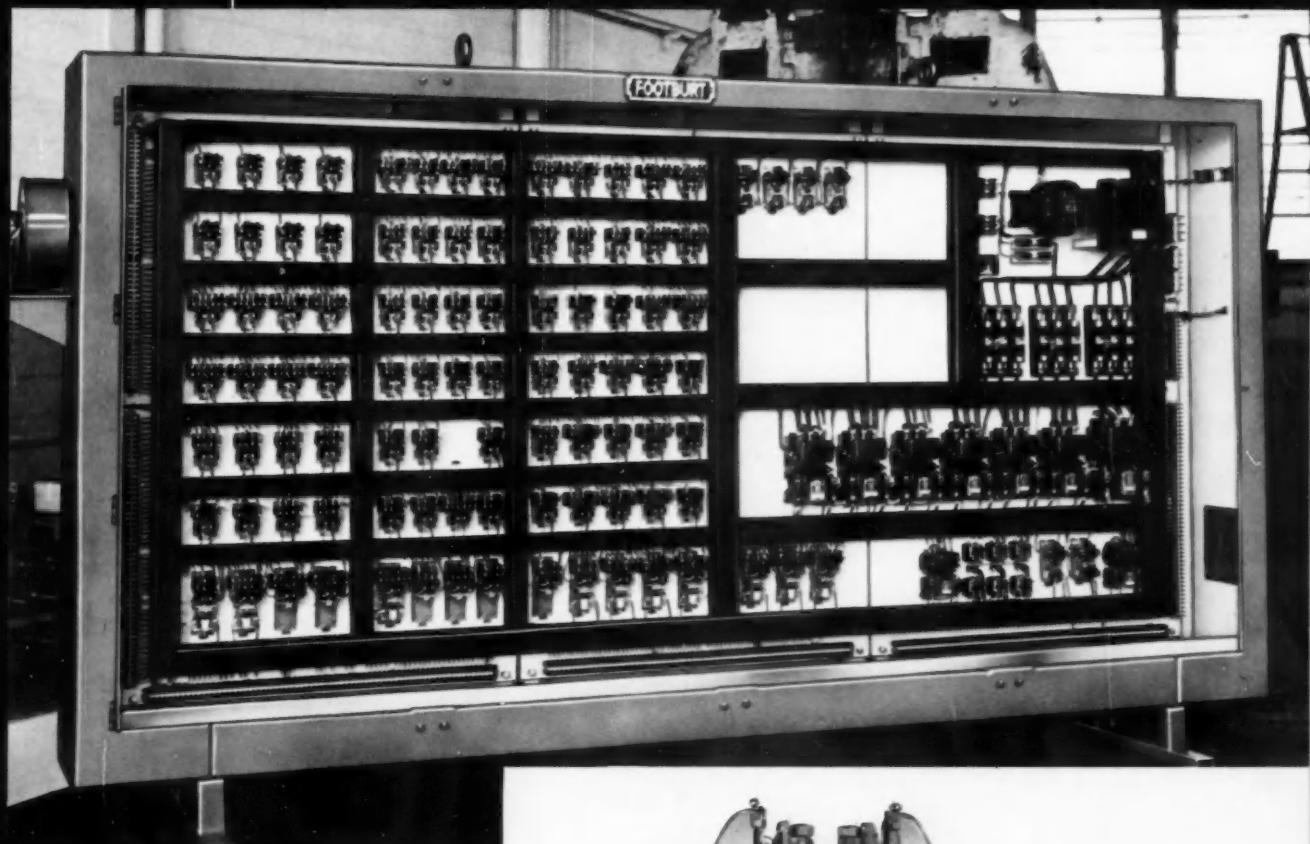
IMPROVED DRAWING AND COLD FORMING

Granodraw® for steel, Granodraw SS for stainless, and Alodine® for aluminum for an integral coating with the base metal which facilitates the cold mechanical deformation of the metal, improves drawing characteristics and lengthens die life.

A pioneer in the development and servicing of metal treatment processes

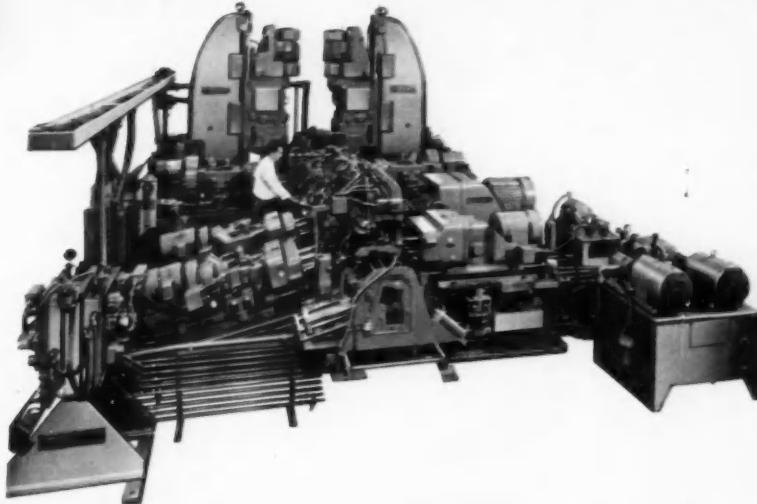


Another Manufacturer Uses G-E Control For Automotive Industry Machines



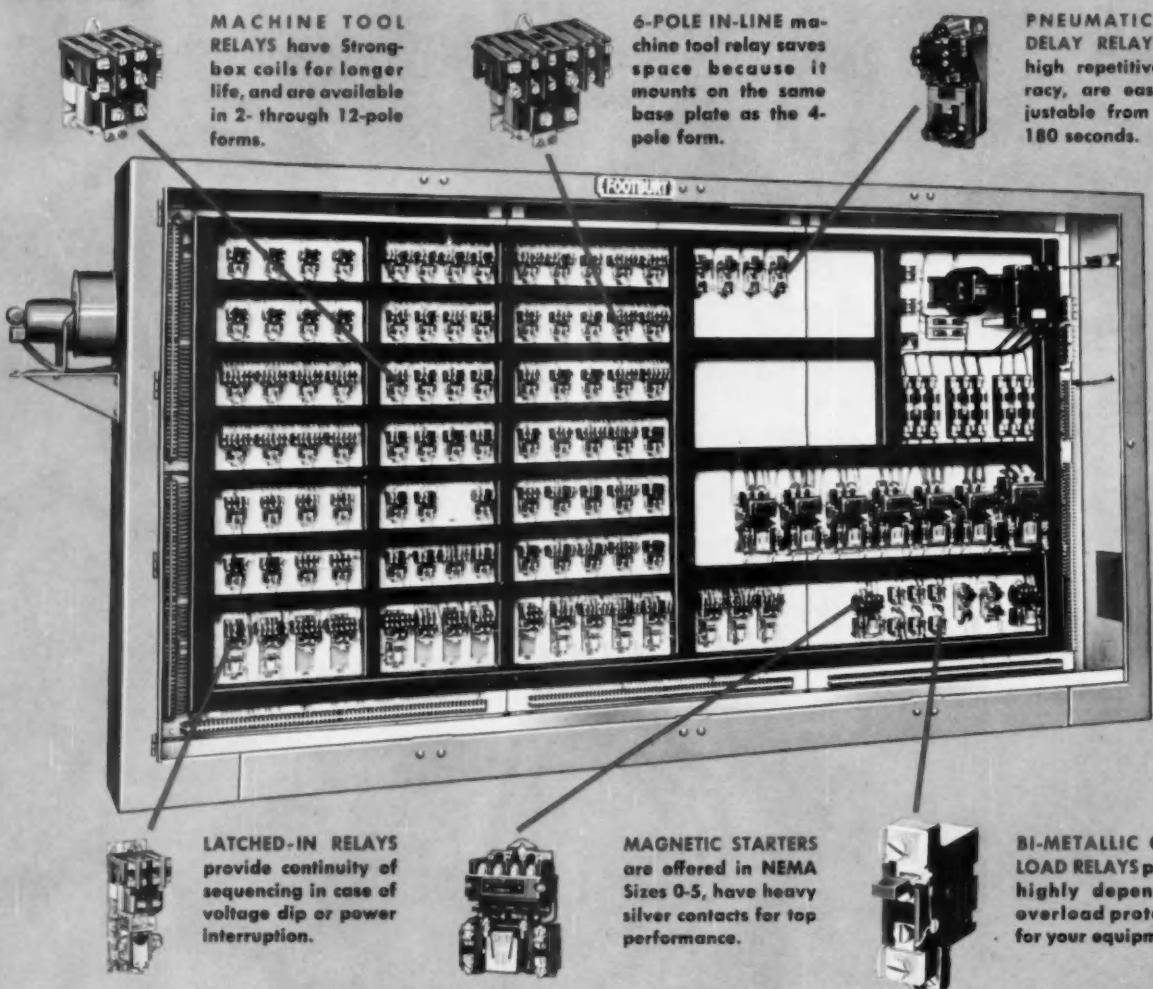
General Electric devices in the above panel control a ten-station, 39-spindle, hydraulic feed drilling machine that will be used in the plant of a major automotive manufacturer. Manufactured by The Foote-Burt Company of Cleveland, Ohio, the machine was designed to perform all operations automatically. This machine is one of three sections of a complete transfer line with each section capable of producing 130 parts each hour.

Components of the control panel were supplied by General Electric, and include 9 magnetic starters, 93 machine tool relays, and 6 pneumatic time-delay relays. In addition, 94 General Electric oil-tight push buttons, selector switches, and indicating lights are mounted on a small master control panel and on auxiliary control stations on the machine.



For a description of the G-E control devices used by The Foote-Burt Company in the panel for this machine, turn the page.

GENERAL  **ELECTRIC**



G-E Control for the Automotive Industry

Other G-E Control Devices for JIC Applications



OIL-TIGHT PUSH BUTTONS are offered in a wide variety of interchangeable operators and indicating lights. Lights and rings are available in six colors for flexibility and easy identification.



STRONGBOX SOLENOIDS have coils sealed against the entrance of oil, dust, and moisture for longer life. They're available in a full range of ratings in both push and pull forms.

These General Electric control devices are designed to give long service and the high degree of reliability required by automotive applications. Built to meet JIC Standards, G-E control provides easy installation, simplified maintenance, and highly dependable operation.

Whether for use on machines in your own plant or on equipment bought from suppliers, specify General Electric control. Your nearest G-E Apparatus Sales Office or Distributor has full information for you. Also, if you do not have a copy of "G-E Control for JIC Standards," write for bulletin GEA-6317 to Advertising Section 733-23, General Electric Company, Bloomington, Illinois.

GENERAL  ELECTRIC

Work Space Increased By Two-in-One Benches

(Continued from page 72)

For larger tools—pliers, wrenches, hand files and the like—there's a bottom-of-the-bench storage section with three large drawers. Alongside this is ample cabinet space for storing still larger tools, cans of solvent and cleaner and bulky materials and supplies.

All bottom-of-the-bench storage is protected by a single lock just under the bench top. The key for this lock also fits the lock on the top-of-the-bench storage section. All locks are master keyed so that in an emergency supervisors can gain access to needed equipment or workpieces.

Each bench sits on a hollow base. This permits space-saving connection with utility lines—electric, gas and compressed air—which are brought directly up into the base from the floor. There's no need to waste floor space by bringing these lines up the back or side of the bench. Electric, gas and air outlets are all made through cutouts in the bench base.

There's an electric outlet at every bench and a compressed air connection at every third bench in all three shops. In the metals shop, a gas outlet is provided at every third bench. The utility base plus the basic design of the bench frame permits GM to bolt units together side by side in long wall runs or back-to-back in compact islands in the middle of the shop floor.

One run of 13 benches along a wall in the wood shop provides an uninterrupted expanse of 91 ft of bench top. It permits workmen to use more than seven feet of bench when the work requires it.

Basic bench dimensions are: tabletop height—32 in.; overall height—54 in.; overall length—84 in.; overall depth—39 in.

The benches are manufactured by Standard Pressed Steel Co., Jenkintown, Pa. To date, GM has installed 174 of these units in the wood, metal, and plastics shops of the Technical Center's Styling Building, where skilled craftsmen fashion mockups and models of GM cars of the future.

AUTOMOTIVE INDUSTRIES . . .

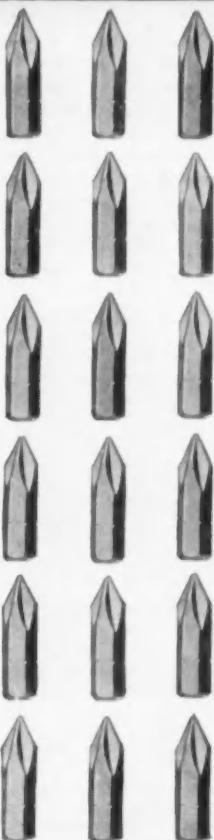
**Is your News Magazine of
Automotive and Aviation
MANUFACTURING**

eighteen identical APEX insert bits . . .

Here are eighteen Apex 440-2 insert bits for No. 2 Phillips recess.

Each bit fits perfectly into the screw head recess, gets a firm purchase to drive the screw smoothly and easily.

Every bit is precision-built of special shock-resisting steel, and is notched at the hex corners to accept the patented bit retaining ring found only in Apex bit holders.



... for eighteen different screwdriving jobs

These eighteen Apex insert bits are identical, except that each one has been hardened through one of three basically different heat treatments, then tempered to meet one of eighteen totally different application requirements. These varying degrees of tensile strength and Rockwell C hardness provide the proper combination of toughness and hardness, insure greater resistance to impact, fatigue and wear. That's why Apex bits last longer, drive more screws, help reduce screwdriving costs.

Selection of the correct Apex bit for a specific screwdriving application is controlled through the complete records Apex maintains on each customer's requirements. You can select Apex insert bits exactly tailored to your requirements, to drive Phillips, Frearson (Reed & Prince), Slotted, Clutch Head or Socket Head screws. Apex—the authority on fastening—offers a complete range of screwdriving tools for manual or power operation. Write on your company letterhead please, for Catalog 21.

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SHREVEPORT • SOUTH BEND • SYRACUSE • WICHITA

New Press and Welding Setups

BRIGGS PLANT IN ENGLAND

(Continued from page 65)

Panel are ejected automatically in all cases, and belt conveyors carrying the completed panels meet at the pre-clinch fixture where the two parts are manually fitted into it. Air-operated tools force the panels into alignment, then bend over the outer flange at several points to hold the assembly together.

A roller conveyor moves the unit to the clinch press which does the complete mechanical joint and ejects the door onto a gravity roller leading to the final welding press. This welds around the skirt with heads similar to those used on the fenders to avoid marking the outer skin, and, to secure the glass run channel, uses indepen-

dent self-equalizing heads with jaw-type top and bottom electrodes.

The closest approach to automation at Briggs is a five-station transfer machine for completing all welds on the underbody of integrally-constructed Ford cars. There is a total of 588 welds, and output is currently running at 40 units per hour. The identical bridge-type presses are linked by rails for through passage of trolleys carrying the lower electrode tooling. The parallel return rails, with a shuttling section at each end, incorporate the load and unload stations.

Five trolleys are normally used, and at the start of the line these are loaded with the rear frame assembly, engine compartment, front and rear floor pans, and other pressings. Toggle clamps are pneumatically operated by applying an external air line. The loaded trolley then rolls onto the shuttling sections which move it across into position to be picked up by the transfer mechanism.

Progress is then fully automatic as the trolley and fixture move through the five welding presses. At each station the section of track supporting the trolley rises hydraulically to press the underbody stampings against the sets of top electrodes. Presses are wired to give five different weld time settings, and these can be fired twice each. Interlocks on each control panel permit only one machine to fire at a time, thus reducing the peak load on the main supply circuit.

Several of the machines have mechanisms which displace sets of upper electrodes to effect close pitch welding within a given transformer layout, and also reduce the cost per weld. These special guns are fitted to slides which lift after the first weld sequence, index transversely, then drop again for the second sequence.

Bottom electrodes on the trolley are adjustable, but are maintained by a template in their correct pattern. This tooling is universal and can accommodate underbodies for the Consul, Zephyr-Zodiac, automatic transmission models, and special assemblies intended for overseas shipment in knocked-down form.

Perfect Circle To Produce Piston Rings In Australia

Perfect Circle Corp. has entered into an agreement with Automotive Components, Ltd., of Sydney, Australia, to make piston rings in the growing Australian market. Under the agreement, manufacturing will be done by Circle Proprietary, Ltd., a wholly owned subsidiary formed by Automotive Components.

Hardened and Ground Parts are our Specialty

This king pin is truly king-size: 8" long and weighs about 12 lbs. We machined it out of No. 3140-2½" bar steel. After heat treating, bearing surface was given the specified fine finish-grind to 2½" dia., +.000 -.001.

Parts like this are our specialty—we've been making them exclusively for the automobile industry for more than 40 years. Each year has added to our knowledge and skill in precise machining, scientifically-controlled heat treating and micro-finish grinding. Let us show you what we can do with one of your tough jobs. Write or wire.

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Experienced production on:

King Pins • Wheel Studs
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Countershafts • Idler Shafts
Stub Axle Shafts
Steering Ball Bolts
5th-Wheel Rocker Shafts
Water Pump Shafts
... anything in the hardened and
ground line, of any analysis steel,
up to 4½" diameter.

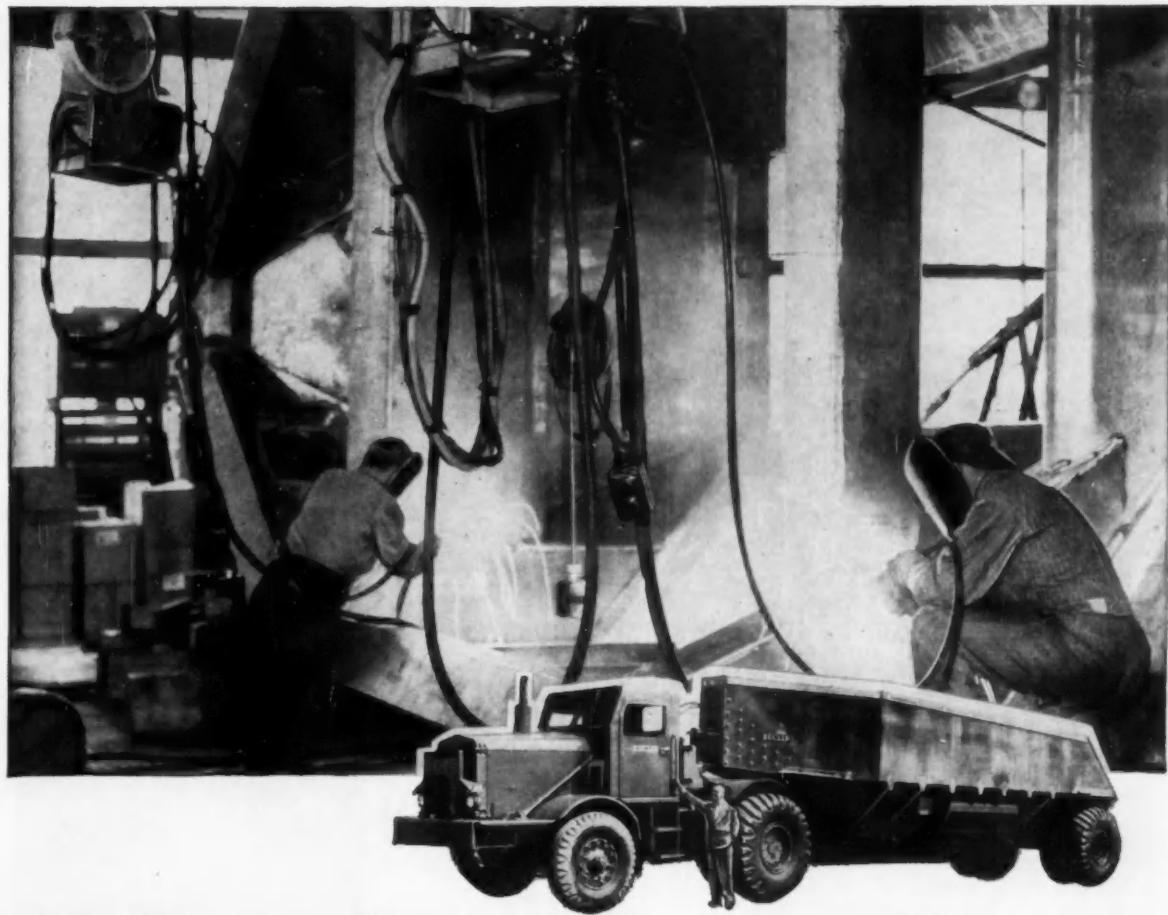


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Sigma Welding helps up truck pay-load 5 tons

The less weight consumed in a truck's structure, the more room there is for the all important pay-load. By sigma welding these giant drop-bottom dump trailers of sturdy aluminum alloy, 8,210 lb. dead-weight has been eliminated—and truck capacity increased 5 tons.

In this operation, sigma rod feed units are suspended above the work area to allow each operator complete freedom of movement with his sigma torch. Sigma welding operations are fast, and finished welds are of highest quality. The 36-ft. long trailers are fabricated of $\frac{5}{16}$ and $\frac{5}{8}$ -in. plate,

and $\frac{3}{8}$ and $\frac{3}{4}$ -in. channel extrusions.

Like many other products throughout industry, these trailers are being fabricated with new quality and efficiency using sigma welding with argon shielding. Sigma welding produces smooth, high-quality welds in all type joints, and exceeds 100 in. per min. in many operations. It is an efficient method for joining such metals and alloys as carbon steel, stainless steel, copper, bronze, aluminum, and unalloyed titanium. Start saving now with greater production speed and unit quality—call your local LINDE representative today.

Linde Air Products Company

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y.

Offices in Other Principal Cities

In Canada: LINDE AIR PRODUCTS COMPANY
(formerly Dominion Oxygen Company)

Division of Union Carbide Canada Limited, Toronto

The term "Linde" is a registered trade-mark of Union Carbide and Carbon Corporation.



How uses automatic finishing equipment



Binks installation at International Harvester "...paid for itself 1½ times in first year of operation."

Improving product quality by improving production methods is typical of the International Harvester Company. About one year ago International sought an economical way to speed up the coating of radiator cores for its well known tractors and trucks...and to reduce the number of rejects.

K. J. Merner, Paint Engineer at International's Melrose Park, Ill., Works, called in Binks engineers to help him and his associates solve the problem. The result is a custom-designed Binks Flo-Coat machine which, says Mr. Merner, "paid for itself 1½ times in the first year of operation."

This unusual economy is obtained by:

- (1) The finishing of radiator cores at unprecedented speeds.
- (2) Complete, uniform coating of even hard-to-get-at areas.

- (3) Reduction of material waste to the minimum.
- (4) Almost total elimination of rejected radiator cores.

For every industry

Almost any mass-produced product manufactured today can be finished or coated...better, faster and more economically...with Binks automatic finishing equipment.

FREE ENGINEERING HELP

Binks engineers work closely with manufacturers in the design and installation of automatic equipment that meets special requirements. Binks' long experience in this field is available to you without obligation. Just contact your nearest Binks Branch Office, or write directly to the address below:

602
Binks
EVERYTHING FOR
SPRAY PAINTING



GUNS



SPRAY BOOTHS



FREE INSTRUCTION

Binks Manufacturing Company
3120-30 Carroll Ave., West, Chicago 12, Ill.

REPRESENTATIVES IN PRINCIPAL U.S. & CANADIAN CITIES - SEE YOUR CLASSIFIED  DIRECTORY

New Production and Plant Equipment

(Continued from page 87)

Magnetic Drill Press

A UTOMATIC power feed has been added to the Portomag drill press, according to a recent announcement. While the electro-magnetic base holds the drill press in position, the new power feed makes it possible for the operator to run the drill point down to the center punch mark, turn on the automatic feed, and let the drill complete the operation.

The power feed may be engaged or disengaged at any time during the



Portomag electro-magnetic drill press equipped with automatic power feed

drilling operation; and the depth of cut per revolution is adjustable for the size of drill bit being used.

In addition to having portability for taking to the work, the power feed unit is said to be capable of drilling up to 1½-in. and tapping 1-in. holes with accuracy. *Portomag, Inc.*

Circle 56 on postcard for more data

Throw-Away Blanks

THE use of a permanent system of identification on a line of cemented tungsten carbide throw-away blanks was recently announced. In pressing the designations 1/64-in. deep into the faces of the six grades of throw-aways made by the company, the symbols used are a square, semi-circle, triangle, circle, diamond or rectangle. These, in turn, are tied in, in each case, with the company grade, industry designation, and application on a reference chart. *Carmet Div., Allegheny Ludlum Steel Corp.*

Circle 57 on postcard for more data



Allis-Chalmers Induction Heaters Cut Brazing Time 50% and Increase Uniformity

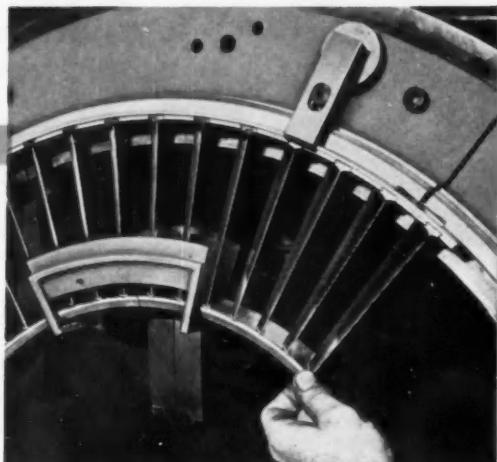
Here's what happened when a turbojet engine manufacturer replaced hand brazing methods with eight Allis-Chalmers Electronic Induction Heaters.

The work involved brazing shrouds to the tips of compressor blades.

Today, using the Induction Heaters and special fixtures, the job is performed in a continuous operation without pulsation or reheating of components. It takes only half the time formerly required. Braze are more uniform and the average pull test loading is 33% above minimum of 2800 pounds.

Here's what Induction Heating can do for you ...

If your work involves brazing, soldering, annealing, heating or hardening — it will pay you to know about Allis-Chalmers Induction Heaters. In practically every installation they have re-



The braze alloy, in wire form, is clip shaped. Photo shows how clip is slipped over one edge of the blade. As alloy heats, at temperatures from 1350 to 1400 F, it flows around the entire base of the blade.

sulted in substantial increases in production or product preference, and healthy cuts in material costs and rejects. See your nearby district office or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS



A-4578

The BUSINESS PULSE

(Continued from page 98)

men to ask whether there is any point in sharply expanding productive capacity.

Consumer Spending

Retailers had been hopeful that consumers would throw off some of their lethargy during the Christmas period, but such preliminary information as is available at this writing is

not especially encouraging. Through the middle of December, for example, department stores across the nation were doing little better than holding their own by comparison with year-earlier levels. And despite a quickening in automobile sales in December as compared with the early part of the new-model season, there was little prospect that total retail deliveries for the month would match

those of December, 1955. Some acceleration of the general sales pace apparently did occur in the week immediately preceding Christmas, but even so it is questionable whether retailers in general emerged from the holiday period with inventories reduced to levels which they regarded as satisfactory. Thus, it is clear that nothing in the area of retail trade can as yet be taken for granted.

So far there is not much evidence that business analysts have been particularly impressed by these developing threats to the future pattern of investment expenditure. Generally speaking, forecasts of economic activity for 1957 have been moderately optimistic, and the consensus seems to be that the year will witness another rise of from 3 to 5 per cent in gross national product.

Outlook for 1957

Some analysts apparently reason that investment is essentially geared to long-term factors and consequently is not likely to be seriously affected by short-term demand considerations. Others apparently attribute recent sales sluggishness largely to unfavorable weather and seem to be counting on a stronger trend of consumer buying before long and particularly on a revival of automobile purchases. Still others apparently look to an increase in Government spending to compensate for any weakening in investment, their reasoning being that such items as military outlay and foreign aid will be stepped up in view of the deterioration which has lately occurred in international relations. A fairly strong case for the emergence of such supplementary strength can indeed be made, which apparently explains why there have been so few forecasts of a business downturn in 1957. Nevertheless, it is clear that the possibility that recessive tendencies may emerge in the year ahead cannot be entirely ignored.

Argentine Concern Licensed To Manufacture B-W Clutches

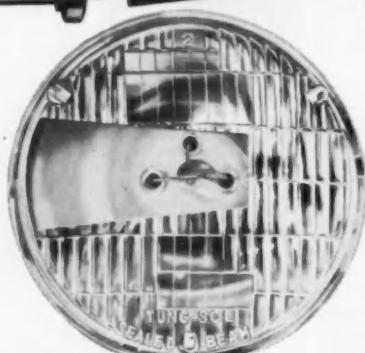
Clutches made by the Borg & Beck and Long Manufacturing Divs. of Borg-Warner Corp. will be manufactured in Argentina under agreements negotiated by Borg-Warner International Corp. and the Wobron concern of Buenos Aires.

Wobron, leading clutch manufacturer in Argentina, will be furnished Borg-Warner patents, trademarks, engineering data, and technical assistance. In addition, B-W International will participate in the management of the firm.

VISION-AID HEADLAMPS FOR 4-HEADLIGHT CARS

4001
One Filament

4002
Two Filaments



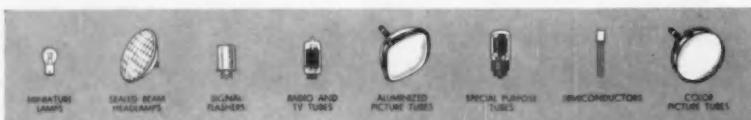
4001—This 5 1/4" high beam lamp has its 37 1/2 watt single filament positioned at the focal point of the reflector for maximum efficiency. Has E-Z Aim Platforms for quick daylight adjustment with all mechanical aimers or may be aimed by conventional methods. Locating bosses (seating lugs) on back of reflector permit correct installation in 4001 housing only.

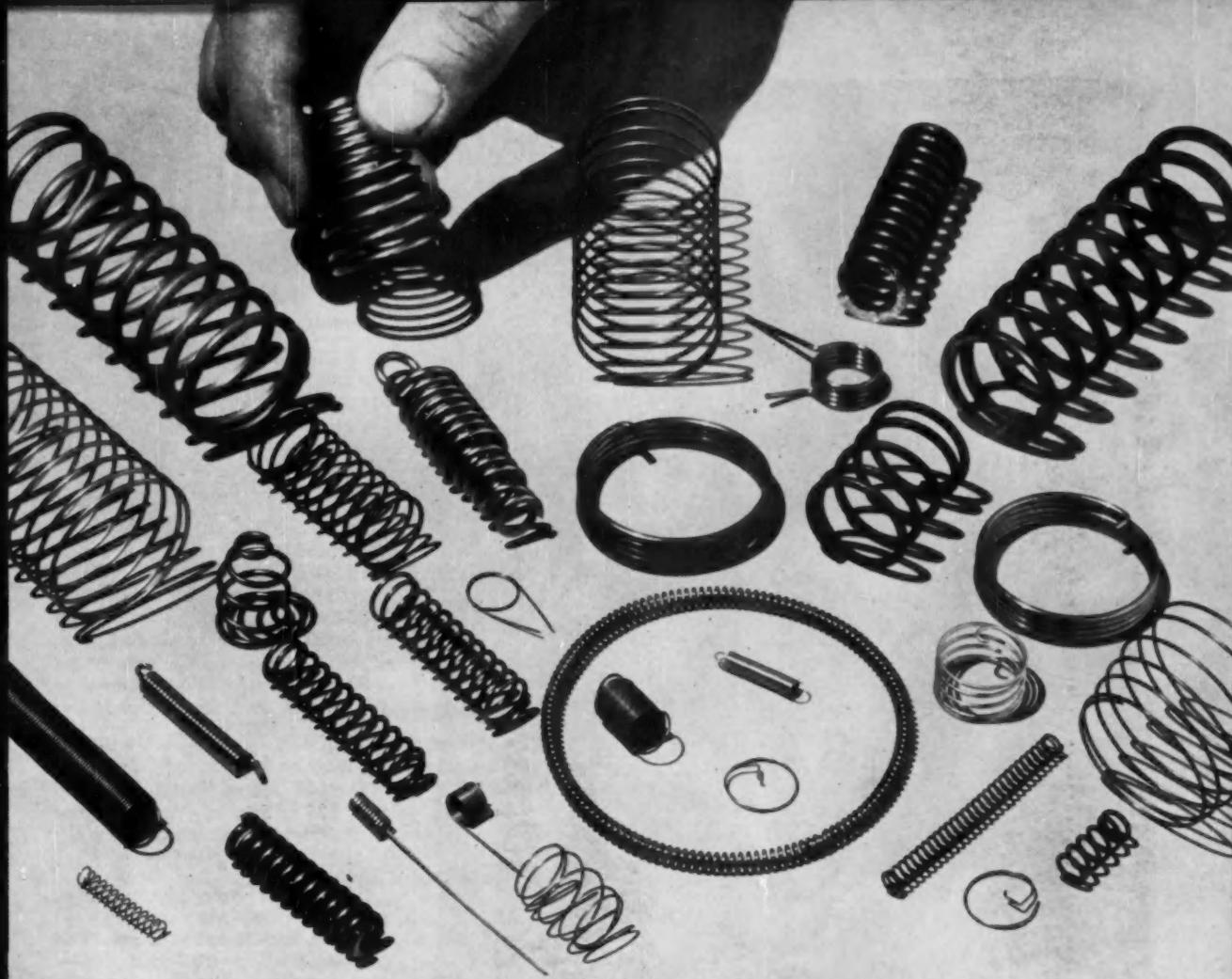
4002—This 5 1/4" lamp has a 37 1/2 watt high beam filament and a 50 watt low beam filament. The low beam filament is positioned at the focal point of the reflector to deliver a greatly improved passing illumination pattern. The high beam filament delivers light that is supplementary to the high beam single filament lamp (4001). Low beam filament equipped with anti-glare fog cap. Lamp has E-Z Aim Platforms. Locating bosses (seating lugs) on back of reflector permit correct installation in 4002 housing only.

TUNG-SOL
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SIGNAL FLASHERS

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Newark 4, N. J.

Sales Offices: Atlanta, Ga.; Columbus, Ohio; Culver City, Calif.; Dallas, Texas; Denver, Colo.; Detroit, Mich.; Irvington, N. J.; Melrose Park, Ill.; Newark, N. J.; Philadelphia, Pa.; Seattle, Wash.; Canada: Montreal, P. Q.





How the right "COAT" solves many spring problems

• Unless you yourself go in for forming wire springs, you have no idea what a tricky business it is. For one thing, as every fabricator knows, it takes extreme uniformity in the wire to obtain the precise dimensions and the exacting tension, torsion or compression characteristics so often required.

But uniformity alone won't always do the trick! As a leading supplier of special wire for tougher-than-usual spring requirements, National-Standard has delved deep into production problems and has come up with answers that help many a fabricator hold better to tough specifications and produce faster with less waste

and more profit!

Time and again, for example, National-Standard has shown that merely a change in wire *coating* or lubrication quality is of major importance in forming operations. Proper coating also helps gain uniform dimensional response to heat treating. Quite often, in fact, troubles chalked up to wire variance are really the fault of improper coating or finish.

Helping fabricators solve problems and cut costs is a National-Standard specialty. We're geared for it and make a point of it. Try us and see!

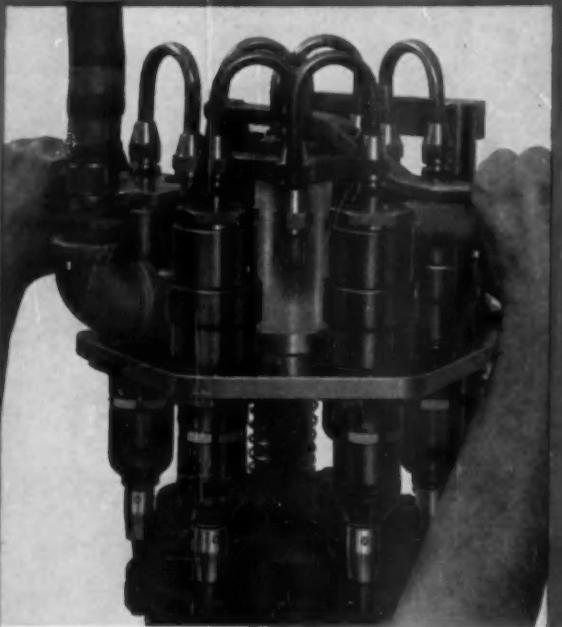
NATIONAL  **STANDARD**

DIVISIONS: NATIONAL-STANDARD, Niles, Mich.; tire wire, stainless, music spring and plated wire • WORCESTER WIRE WORKS, Worcester, Mass.; high and low carbon specialty wires
WAGNER LITHO MACHINERY, Secaucus, N. J.; metal decorating equipment • ATHENIA STEEL, Clinton, N. J.; flat, high carbon spring steels • REYNOLDS WIRE, Dixon, Ill.; industrial wire cloth



he HAD
to use a
hand wrench!

but YOU can use
a Buckeye Air Tool!



Why AIR Tools?

Because air is everywhere, just waiting to be put to work . . . because continuous operation can't possibly harm an air tool . . . and because, if you're using Buckeye air tools, you can almost forget about tool maintenance.

This Buckeye Tools multiple-unit fastening tool runs down six hex head bolts simultaneously. It could be designed to handle more bolts, different sizes of bolts, or to run them down at different levels at the same time. Or, it could run down bolts at various angles, even straight up!

This is just one of many new Buckeye fastening tools. Are you sure you're doing your fastening work the modern way? Our Catalog A-10 will help you decide—and it's yours for the asking.

In Air Tools,
Your Best Buy
Is Buckeye

Buckeye Tools
CORPORATION
DIVISION 21 • DAYTON 1, OHIO

SHORTIES

Performance requirements of modern military fighter planes involve the design and engineering of more than three and one half times as many parts as did World War II fighters.

One new U. S. turboprop transport aircraft (1) can carry the load of five railroad freight cars (2) has the cargo potential of a 7000-ton ship through its ability to shuttle rapidly back and forth across the oceans (3) can carry a 50-ton load for distances up to 1000 miles and 25-ton loads for more than 4000 miles.

The 48 states have collected over \$26 billion in gasoline taxes in the last quarter century.

More than three billion gal of petroleum fuels were used in 1955 year by farm tractors alone. The greater portion—83.7 per cent—was gasoline. The balance was comprised of kerosene and other fuels.

A new service station road map usually represents an investment of more than \$20,000 before a single copy is printed for distribution.

Of all the energy used in American production today, about 99 per cent is inanimate. An 1850 worker would require three weeks—at 70 hours per week—to produce as much as the average American worker now produces in a 40-hour week.

Today, there are some seven million automobiles and trucks on farms in the U. S.

Today, U. S. producing wells turn out more than six million barrels of petroleum daily—almost three times the volume produced 25 years ago.

**YOU CAN GAGE
40 or MORE
DIMENSIONS
As Quickly
AS YOU CAN ONE**



Spectacular developments in AIR gaging are saving industry millions of dollars and thousands of man-hours. Here's how and why:

1. One operator with one gage can check up to 40 or more dimensions of each work part simultaneously and instantly. The number of parts per hour depends solely on how fast the inspector can handle them.
2. Precision is built into the gage—readings are unaffected by human skill, human judgment and human memory. It's not necessary to memorize and compare readings for individual dimensions—one quick panoramic glance at the float pattern ("Airechart") tells the whole story—the "Float Graph" shows the true condition of every critical dimension.
3. The position of each float shows just where the dimension is within tolerance limits or just how much above or below limit if it is out of tolerance. This is essential for Quality Control.

PHONE, WIRE or WRITE for the full story on how YOU can "produce more and better products at lower cost through practical precision"—in this case, multiple dimension inspection by Precisionaire gaging.

For Catalog No. IPC 6-56,
write to The Sheffield Corporation,
Dayton 1, Ohio, Dept. 4

Checking 30 points
on a jet engine blade

Gaging heads ready
to approach the jet
engine blade



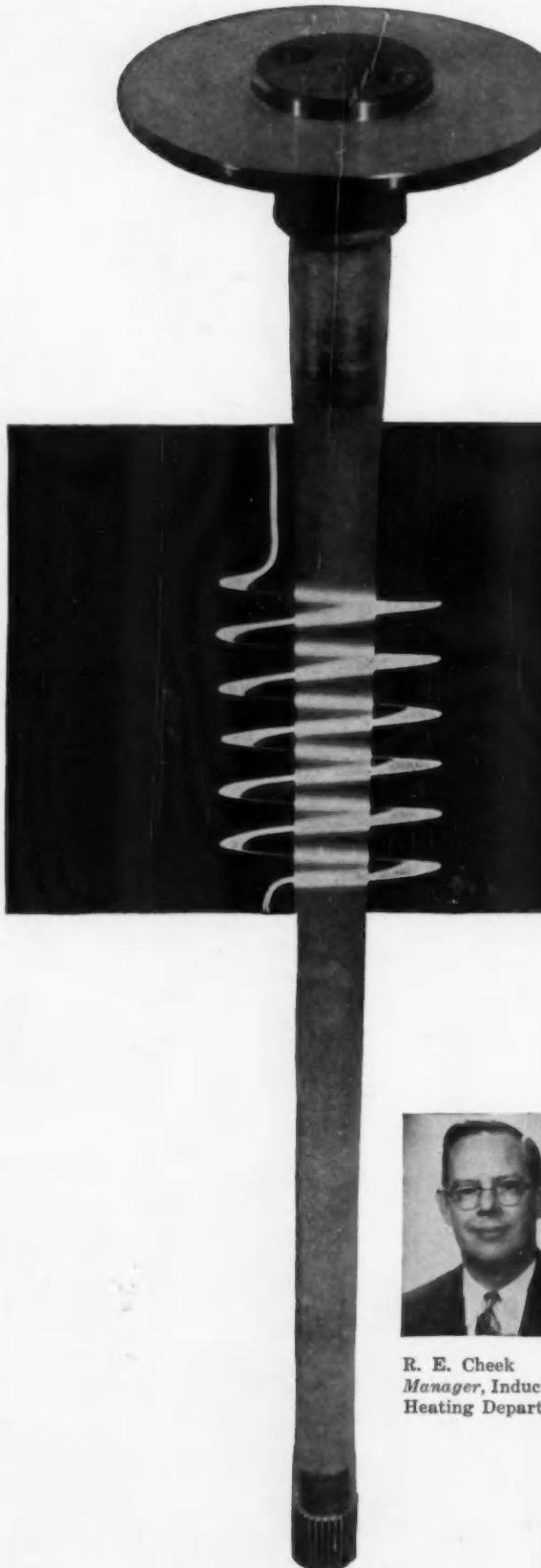
All main bearings of a tractor crankshaft are checked simultaneously



SHEFFIELD

manufacture and measurement for mankind

7682



Westinghouse induction heating

doubles axle



1. A single operator surface-hardens 6 rear-axle shafts at each setup of this Westinghouse induction unit. Production per hour totals 210 shafts.

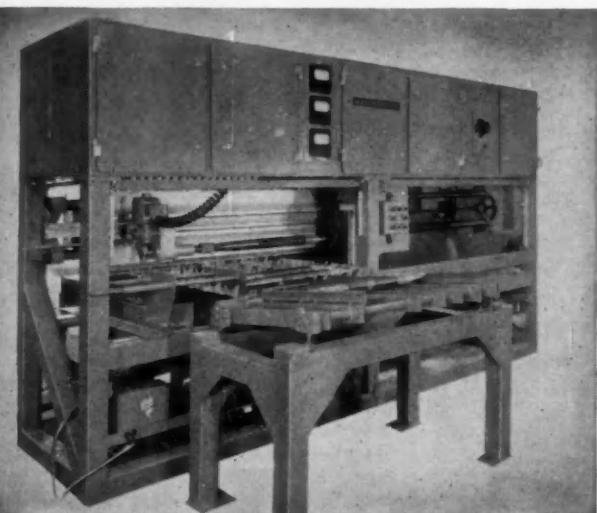


R. E. Cheek
*Manager, Induction
Heating Department*

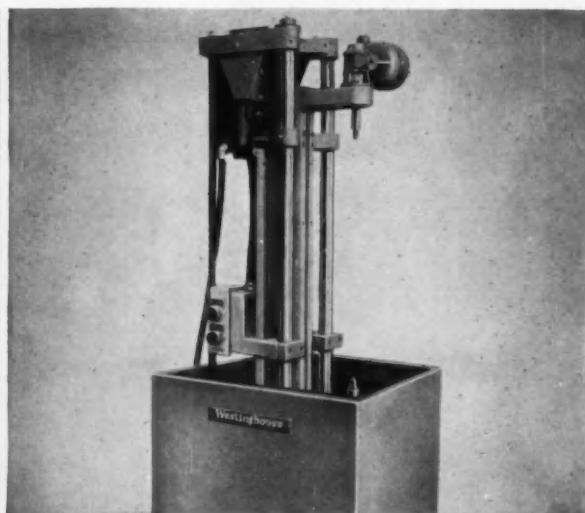
"Three different axle-hardening applications," reports R. E. Cheek, "show a slice of Westinghouse experience in solving production line heat-treating problems. Dependability of Westinghouse induction equipment, for example, protects production timing and holds maintenance to a minimum. Results are measured, too, in three important profit advantages."

1. Twice the axle fatigue life is obtained from lower cost, plain carbon steels. No more need for costlier alloys.
2. Lower carbon steels lengthen tool life . . . reduce machining and replacement costs.
3. Axle shaft distortion is minimized by rapid induction heating and quenching.

fatigue strength . . . lowers cost



2. As many as 33 axle shafts up to 42 inches long and weighing up to 100 lbs. are surface-hardened by this Westinghouse induction equipment.



3. Westinghouse general-purpose induction scanner handles shafts up to 30 inches long, 80 lbs. weight, for surface-hardening and quenching.

Many other factors, such as savings in floor space, rapid start-up, and cooler more productive working conditions add to the high efficiency of each installation.

A profit return for you? Westinghouse induction - heating experience can show you production problems turned into profitable solutions for hardening, annealing, joining, or forging. Why not call on your local Westinghouse industrial heating sales engineer? He'll bring you expert problem solving and complete service. Westinghouse Electric Corporation, Industrial Heating Division, Meadville, Penna.

J-10455-X

**YOU CAN BE SURE...IF IT'S
Westinghouse**

The Westinghouse Heat-Treating Family

GAS • ELECTRIC • INDUCTION

AUTOMOTIVE INDUSTRIES, January 15, 1957

News of the MACHINERY INDUSTRIES

(Continued from page 79)

Year-End Machine Tool Record

Shipments of metal-cutting machine tools for 1956 (December estimated) will total approximately \$885,000,000 as compared to \$670,400,000 for 1955, according to a report from the National Machine Tool Builders' Association.

Net new orders received in 1955 totalled \$927,100,000—an amount considerably in excess of shipments. According to present indications, total net new orders for 1956 will be approximately equal to the 1955 figure.

The industry at year end will have a backlog of approximately seven months at current rate of operations.

The picture is one of sustained demand and stability of operations. The peak of net new orders in the Fall of 1955 reflects the stimulus provided by the Machine Tool Show held in Chicago in September of that year.

In 1956 rated orders for national defense accounted for only seven per



Ervin F. Borisch, executive vice president, Milwaukee Gear Co., has been appointed as Treasurer of the American Gear Manufacturers Association.

SEIBERT ADAPTERS

View of 350 ft. Cross-built V-8 cylinder block machine equipped with Seibert Adapters. Performs a total of 555 operations.

"Meet Our Standards Completely"

Says THE CROSS COMPANY • Detroit

CHECK THESE SEIBERT FEATURES

- Designed with convenient starting ring for easy installation.
- Relieved key seat eliminates swell, assures easier setups.
- Manufactured to GMC, Ford, Chrysler & ASA standards.
- Lot produced, economically priced.



New Tool Control Board—individually designed to suit your needs.



WRITE FOR ADAPTER BULLETIN, LATEST PRICE LIST
Ask for Folio 2-50. Gives complete specifications. Lists range of sizes available from stock. Ask also for brochure illustrating new control boards and complete line of holding tools.



800 Series
Spindle
Extension



900 Series
Spindle
Extension



Compression
or Tension
Tap Driver



Floating
Holder

SEIBERT & SONS, INC.
Quality MULTIPLE DRILL SPINDLES AND PRODUCTION TOOLS

SEIBERT

1008 E. 24th STREET
CHENOA, ILLINOIS

cent of shipments, and foreign orders for only eight per cent; 85 per cent therefore represented domestic peace-time business. And yet total shipments for 1956 were only \$7,000,000 below those for 1954, when the defense demand resulting from the Korean crisis accounted for a large share of the industry's output.

While it can hardly be said that two years' experience constitutes a trend, the figures nevertheless do show conclusively that a high level of operations in the machine tool industry can be founded primarily upon peace-time demand and that there has been a very satisfactory element of stability in peace-time business.

Stability is further evidenced by the fact that no one particular industry, or no one major industrial segment, contributed in particular to the sustained volume of machine tool sales. Continuing orders reflected in part the expansion plans of industry in general, requiring new machines for new plants; but reflected to an even greater extent the growing realization throughout all types of metal-cutting industries that obsolete machines must be replaced by the latest more efficient models in order to secure the manufacturing economies so imperatively demanded under our competitive system. Apparently American industry, on the whole, is planning to turn out greater volume—but at lower cost.

Outlook for 1957

In view of the foregoing it would seem reasonable to expect that barring unforeseen circumstances, machine tool shipments of metal-cutting machine tools for 1957 will at least equal, if not exceed, the total for 1956.

(Turn to page 128, please)



to meet exacting lubrication standards, specify
ENJAY PARATONE®
viscosity-index improver

Refiners and blenders rely on Enjay Paratone for compounding oils that combine cold-weather, quick-starting properties with low consumption characteristics.

You can also count on Enjay for a prompt solution to your additive problems. The Enjay Company, pioneer in petroleum additives, has extensive experience in working with oil companies and leading engine manufacturers to develop additive formulations. Whatever your use of additives, you can benefit from this experience.

For complete information, write or call the Enjay Company—your only source of a *complete* line of additives (Paramins®) for fuels and lubricants.

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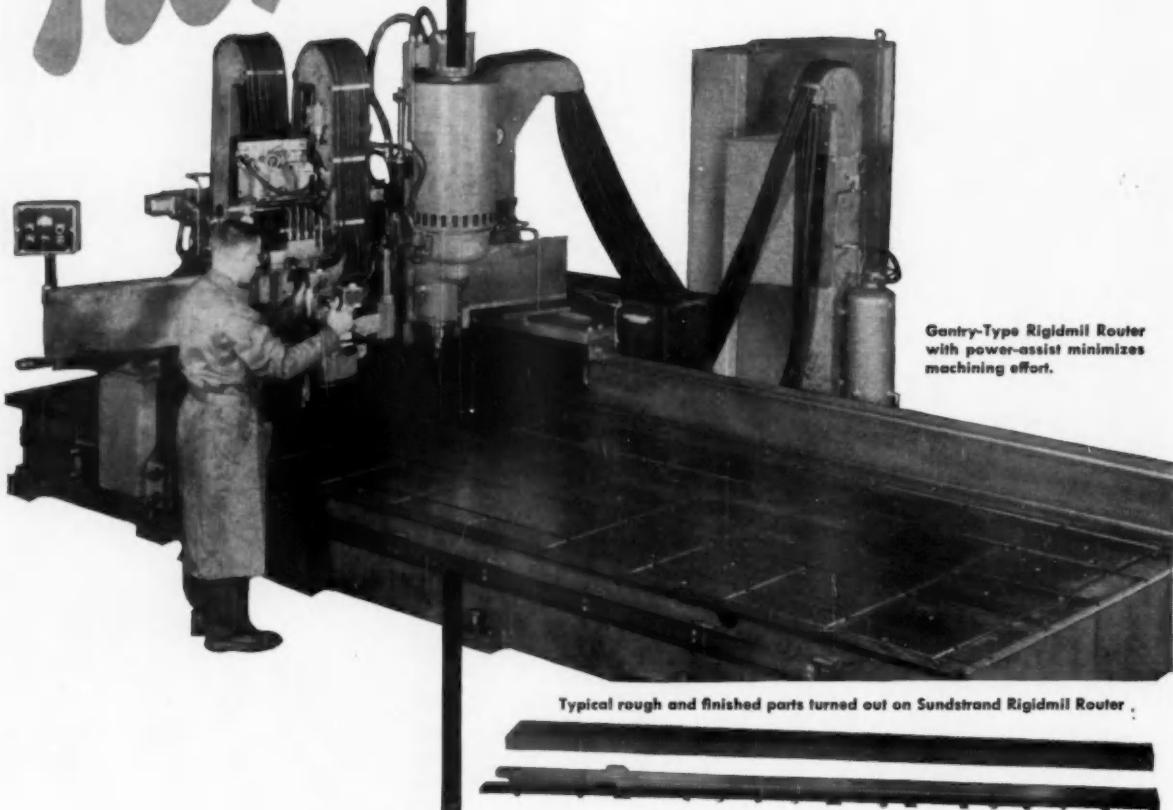
AUTOMOTIVE INDUSTRIES, January 15, 1957



*Pioneer in
Petrochemicals*

new

Sundstrand Power-Assist Rigidmil Router takes the muscle out of machining



Gantry-Type Rigidmil Router
with power-assist minimizes
machining effort.

Typical rough and finished parts turned out on Sundstrand Rigidmil Router

Getting the most out of your Sundstrand Gantry-Type Power-Assist Rigidmil Router doesn't depend on individual operator's strength. With the power-assist doing most of the work, any operator can continue taking husky cuts throughout the entire work day. Sizable work capacity is provided by a four-speed vertical spindle head rated at 15 hp at 7200 rpm. Feed rates over 200 ipm are available so that stock removal is limited only by strength of the cutter and maximum spindle horsepower.

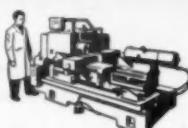
Along with increased output you also get greater precision as the direct result of fingertip control and the reduction in operator fatigue. Conventional routing templates can be used and operator techniques are unchanged.

Power is provided for all three basic movements required in machining with the Rigidmil Router. Longitudinal movement of the gantry and transverse movement of the saddle are controlled by the operator through the power-assist mechanism. Depth movement is controlled by



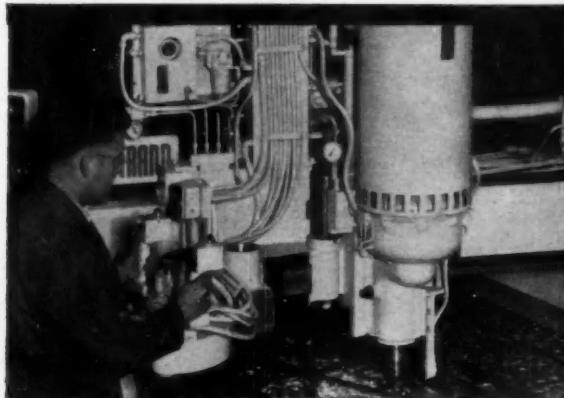
*"Engineered
Production
Service"*
*REG. U. S. PAT. OFF.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS



a conveniently located push button with the downward movement being limited by a 6-station manually indexed turret stop. Using the stop, limits the depth of cut in any single pass of the router tool and permits accurate pre-setting of the depth of cut.

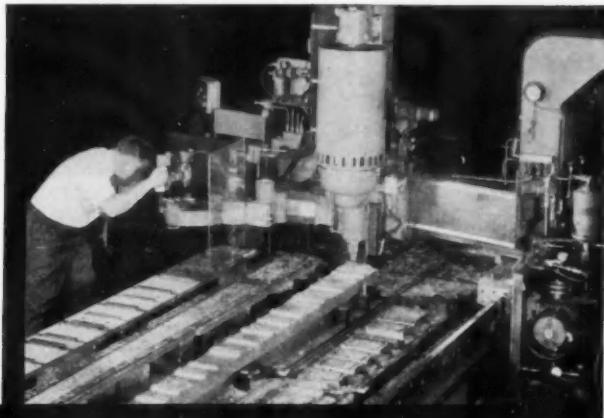
Either offset routing or overlay template work can be done with the new Sundstrand machine. For offset routing, the stylus is mounted in the stylus quill. When the overlay template method is used, a tracing stylus collar guide is mounted around the cutter spindle nose for following templates mounted directly over the work.



Routing using the overlay template method. A tracing stylus collar guide is mounted around the cutter spindle nose to enable duplication of templates mounted directly over the work.

Here are a few additional details about the Sundstrand Rigidmil Router:

- Spindle center covers a rectangular area over the table 12 ft long by 5 ft wide.
- Stationary table is 17 ft long by 5½ ft wide.
- Feed and rapid traverse rate are both determined by the amount of manual pressure exerted on the power-assist handles. Maximum horizontal travel rate is more than 200 inches per minute.
- Maximum vertical travel rate is over 100 inches per minute.
- Massive construction and full support for router head on Sundstrand Rigidmil Router assures vibration-free operation even when taking full power cuts.



Using the offset method ribs are routed out of solid aluminum slab (top). Work is then turned over and moved to fixture directly to the right for machining of reverse side (bottom). Note that machine table readily accommodates two sets of parts, fixtures and templates for the complete machining job, thus reducing setup time.



Rigidmil Router Details.
Learn more about the Sundstrand Power-Assist Rigidmil Router and how it can fit into your production setup by writing for Bulletin 275 today.

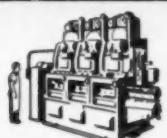
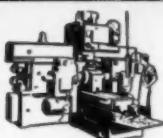


SUNDSTRAND Machine Tool Co.

2571 Eleventh St. • Rockford, Ill., U.S.A.

TRIPLEX RIGIDMILS

SPECIAL MACHINES



America's "Engineered Production" Service



... starts with analyzing suitability of the part for broaching, thus guaranteeing you get broaching tools, machines, and fixtures tailored to your specific job. You are actually adding years of experience, unavailable at any price, to your production engineering staff at no extra cost.

**It takes
all 3
to give you peak
broaching performance**



Broaching 28 involute
splines in bore of automatic
transmission clutch hub.

325 parts per hour with a
completely automatic broach-
ing cycle.

1

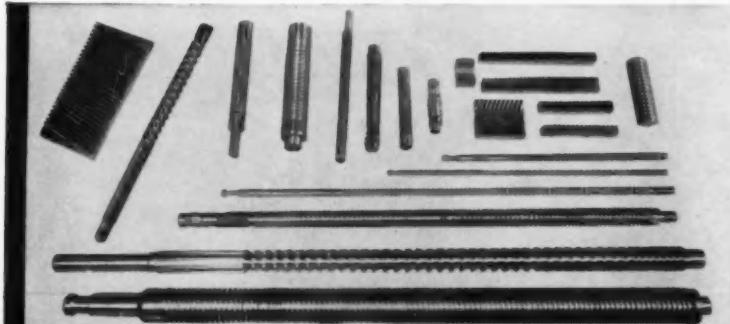
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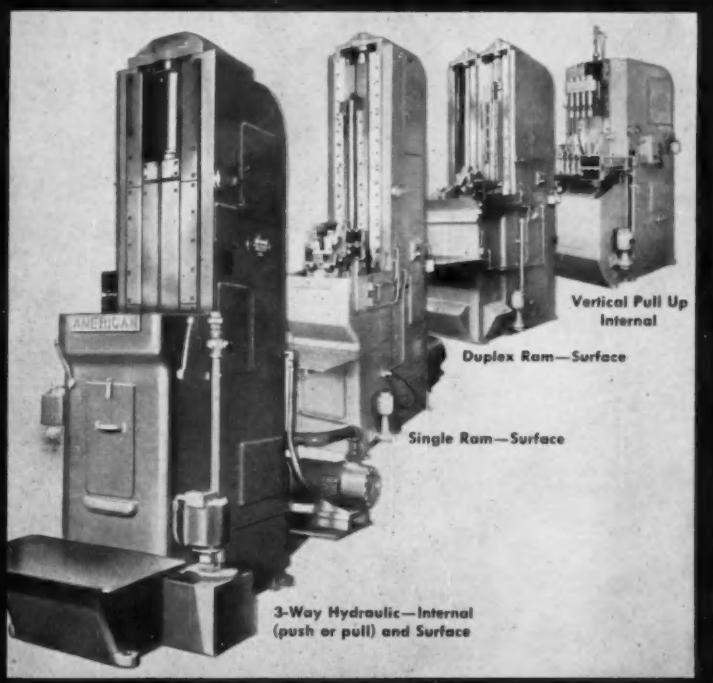
Proper Broach Design

Practical broaching methods begin with the design of the broaching tool. American Broach solves this all-important first step by considering: stock removal, length and width of cut, finish and tolerances required, etc. American's experience in designing and building broches for every type of part capable of being broached pays off in quality of the work and in long tool life. You can be sure the broach and machine will operate as a team because they are designed that way.



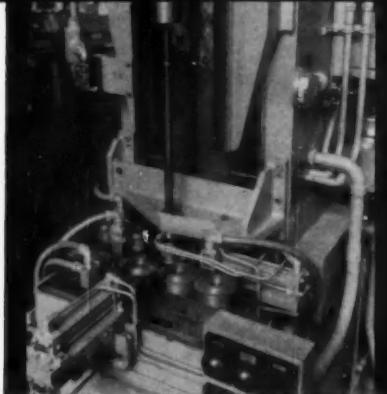
Specifying the Right Machine

Length and speed of stroke, production rate required, relationship to other production machinery, and available floor space dictate the selection of the broaching machine capable of doing the best broaching job. American not only is experienced with every type of internal and surface broaching job but builds a complete range of broaching machines. You can depend on getting the most practical machine for your job from American Broach.



Efficient Fixturing

Whatever your part geometry or hourly needs, fixturing by American Broach forms the vital third link in the production chain. Whether manual loading and unloading is used or the work cycle is completely automatic, workholding fixtures designed and built by American Broach feature easy loading and unloading coupled with positive clamping during the broaching cycle. Even with relatively inexperienced operators, production schedules are maintained since the "skills" are built into the tool, machine, and fixtures.



ADDITIONAL INFORMATION ...

Write for bulletin No. A210 containing information on practical broaching methods by American.



American BROACH & MACHINE CO.
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

News of the MACHINERY INDUSTRIES

(Continued from page 122)

Depreciation Policy Survey

Machinery and Allied Products Institute along with the Council for Technological Advancement recently made a very comprehensive survey in the capital goods industries on equipment replacement and depreciation policies and practices. Since results were tabulated from a 60 per cent return of the questionnaire, it is reasonable to assume that the survey gives an accurate indication of the effect of the 1954 Code on the depreciation policies of industry. We would like to quote a few of the important results from the survey:

Q. What method of depreciation are you using for tax purposes on assets acquired since 1953 (assets subject to the 1954 Code)?

A. Straight-line, 36%; declining balance, 31; sum-of-digits, 31; others, 2.

Q. Do you take the same rates of depreciation for both book and for income tax purposes?

A. Yes, 85%; no, 15.

Q. Do you have an annual capital budget?

A. Yes, 61%; no, 39.

Q. Do you make up a preliminary capital budget for more than one year ahead?

A. Yes, 26%; no, 74.

It is of interest to note that of the respondents answering yes to the last question, 44 per cent prepare a capital budget for two years in advance, 20 per cent for three years, and 36 per cent for five years in advance.

Q. Do you have an individual or staff with special responsibility for the preparation of studies to determine the economic advantage of re-equipment?

A. Yes, 54%; no, 46.

Q. Which of the following methods do you use? (Many returns stated more than one choice).

A. Pay-off period requirement (205 replies). Yes, 60%; no, 40. Rate of return requirement (147 replies). Yes, 34%; no, 66.

Minimum-average-cost method (105 replies). Yes, 24%; no, 76. MAPI method (119 replies). Yes, 47%; no, 53. Discounted-cash-flow method (86 replies). Yes, 2%; no, 98.

"Comments on Results"—Depreciation

In 1948 the taxpayer was given the choice of two methods of depreciation: straight-line, and declining-balance at one and one-half times the straight-line rate. The result was that for all practical purposes only the straight-line method was in use. With the adoption of the Internal Revenue Code of 1954, the taxpayer was, of course, granted the option of choosing from among several methods of depreciation—straight-line, double-declining-balance and sum-of-the-digits. The 1956 survey gives some indication of the extent to which these methods are currently in use. The shift to the new methods—double-declining-balance and sum-of-the-digits—is remarkable. Roughly, two-thirds have adopted

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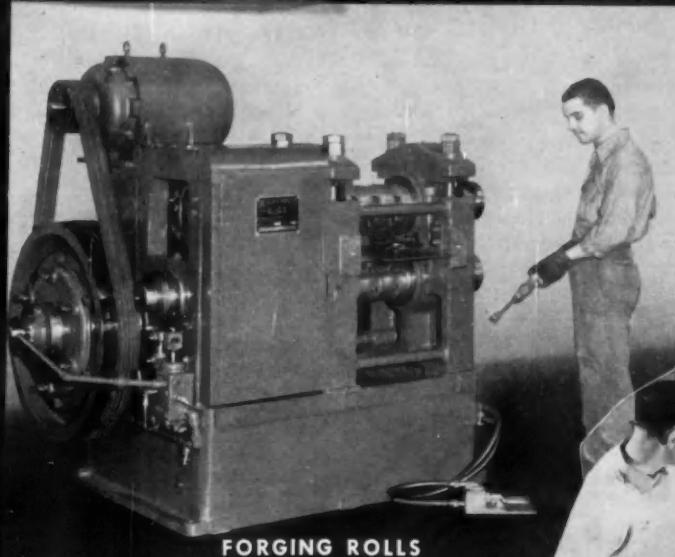
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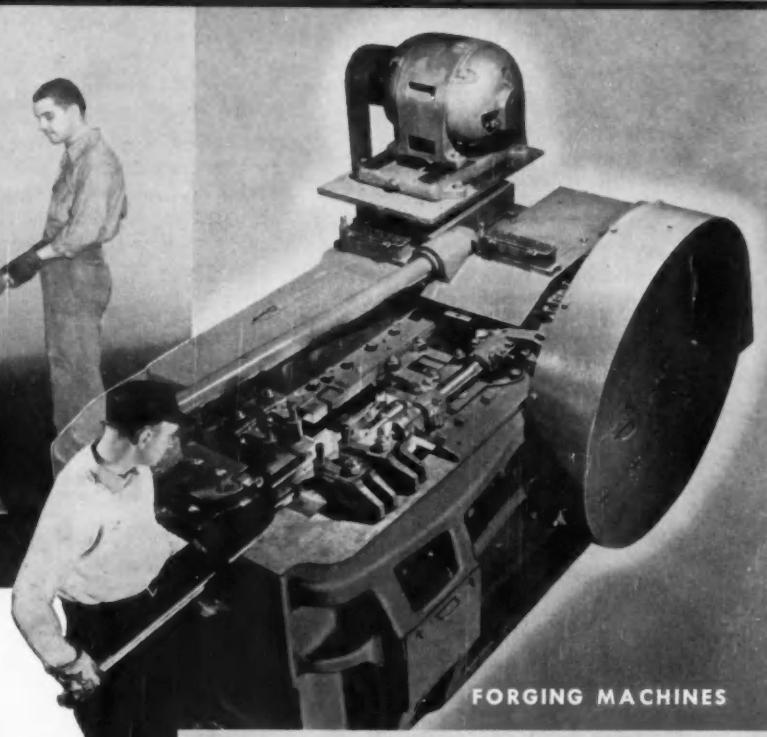
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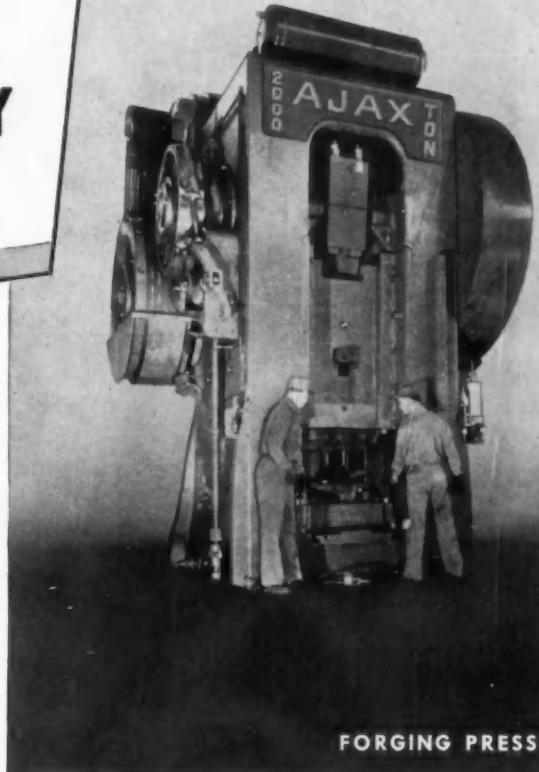
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these methods (one-third double-declining-balance, and one-third sum-of-the-digits), with the remaining one-third continuing to use straight-line depreciation.

"Given the choice of the new methods, it is significant that in answer to a further question 71 per cent of the manufacturers responding believe current methods of distributing depreciation over the service life to be adequate, whereas only 55 per cent are of a similar opinion with respect to present estimates of life expectancy.

Equipment Policy

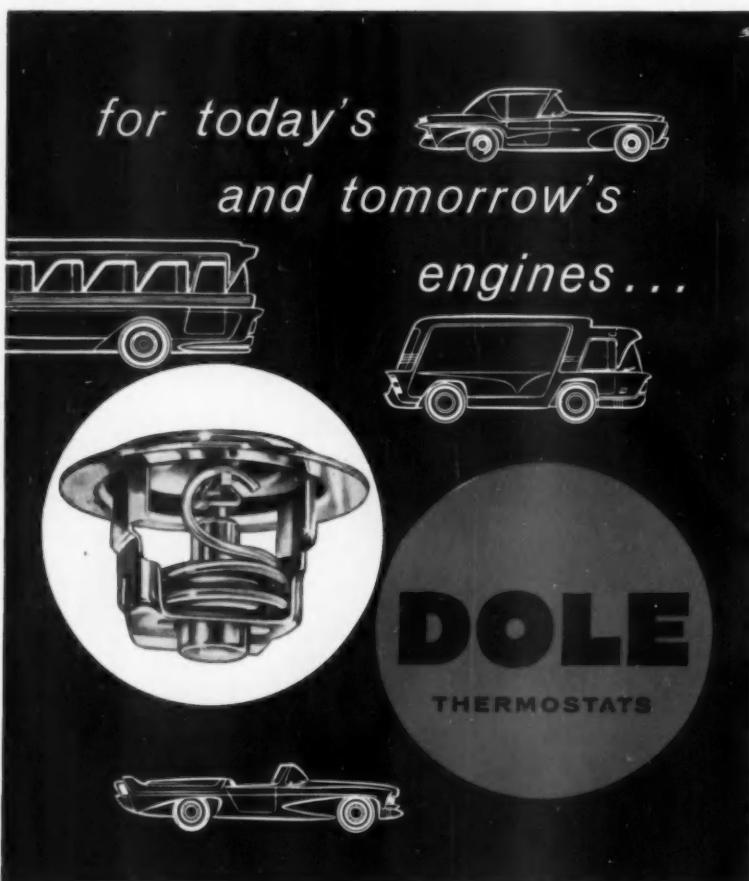
The impression gained from a comparison of the 1948 and 1956 surveys is that the past several years have witnessed the beginning of a revolution in what was, until recently, a backward area of management—equipment policy. This does not gainsay the fact that there remains much room for improvement. For example, 46 per cent of the companies surveyed do not have an individual with special responsibility for the preparation of studies to determine the economic ad-

vantage of re-equipment; 21 per cent fail even to make a regular review of equipment. On the other hand, the comparable figures in the 1948 survey were 72 per cent and 65 per cent.

Apparently these gains are confirmed in the replies to the question: 'What proportion of your customers have personnel charged with special responsibility for the preparation of studies to determine the economic advantage of re-equipment?' The figure for those citing 40 per cent or above in 1956 was 50 per cent as compared with 35 per cent in 1948."

Montagnes Canadian MTBA

Frank K. Gardner, vice-president and general manager of R. MacDougall Co., Galt, Ont., has been elected president of the Canadian Machine Tool Builders Association. The members of the association did about \$22,000,000 in business in 1956, winning back business lost a few years ago to imports, and the association in 1957 expects to have a record year in Canada and U. S. markets.



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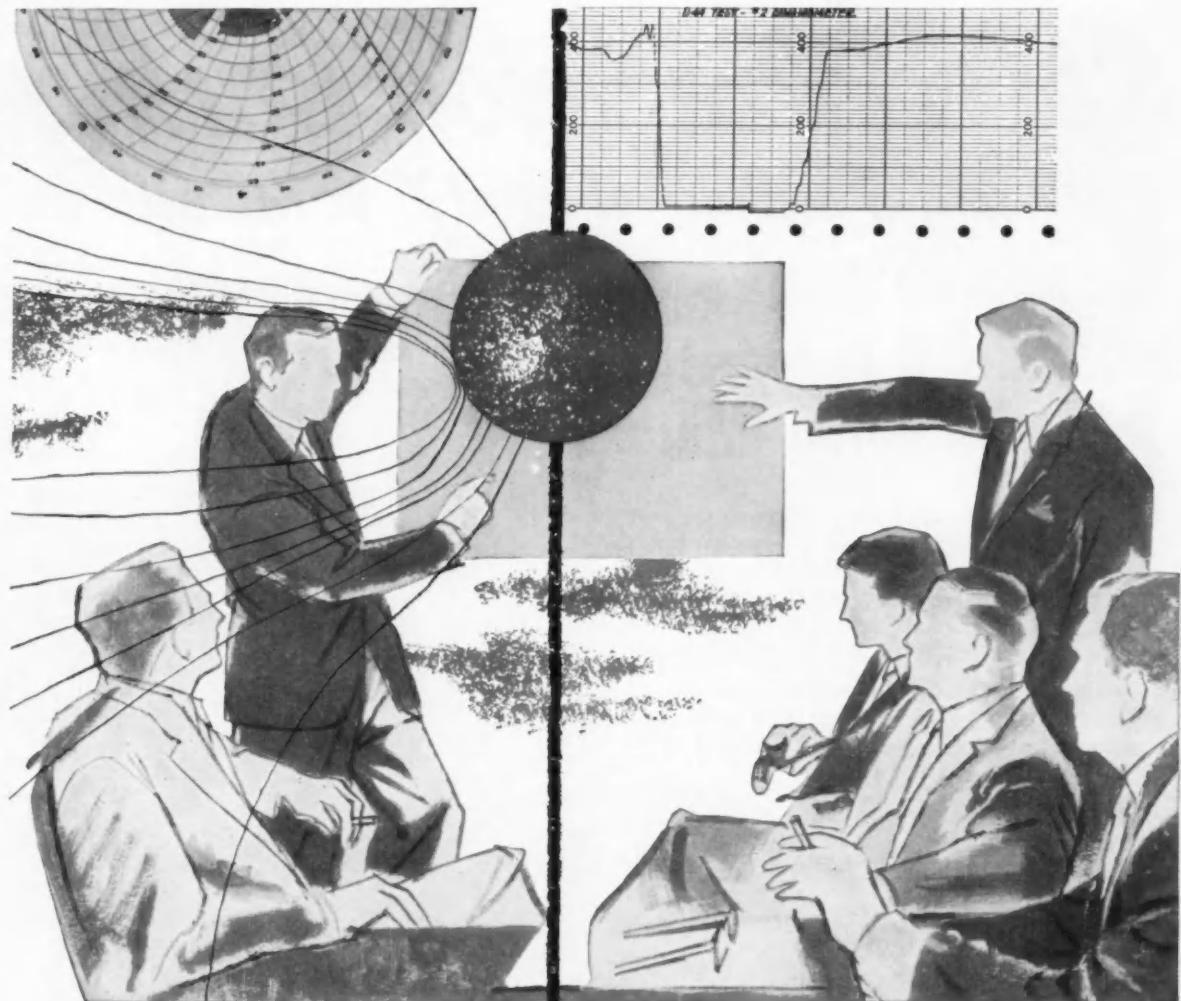
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The painting operations comprise many similar approaches in modern manufacturing techniques, including the application of two colors, blue and white, simultaneously.

After the body meets the Dodge chassis, the Pony Express still has numerous operations to prepare it for shipping. On the final floor-conveyor line hardware is installed, and inspection and testing procedures assure a quality product.



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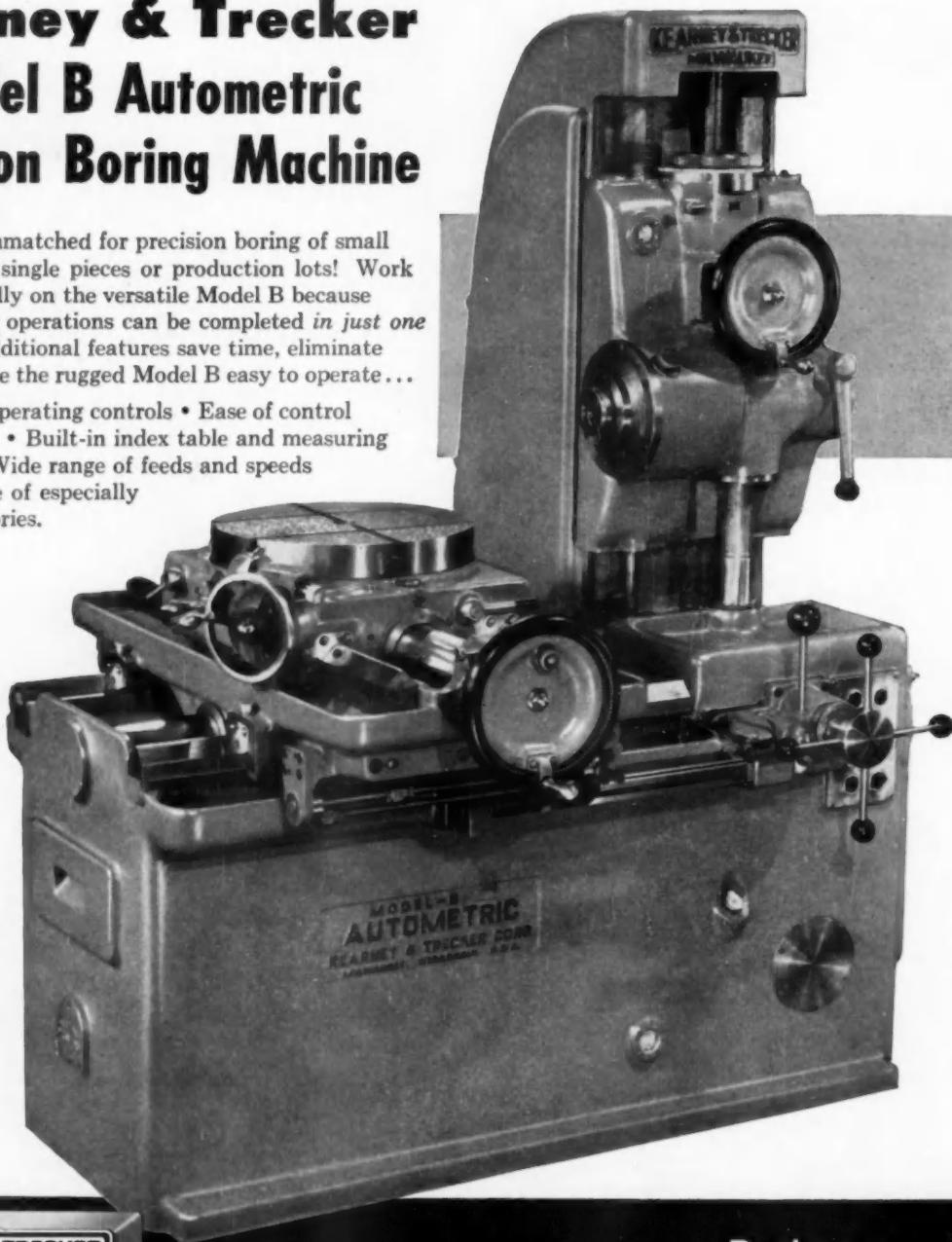
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Marvel-Schebler Fuel Injection System

(Continued from page 58)

more gasoline for cold starting of the engine.

The atomizing nozzle is of the outward opening pintle type, with an operating pressure of 80 psi. The fuel supply pump must maintain approximately 20 psi pressure in the fuel reservoir, and have sufficient capacity to recirculate fuel to the fuel tank at all load conditions. The system provides for deceleration fuel cut-off by movement of the metering valve cam to a full cut-off position.

The injection pump can be mounted in either a horizontal or a vertical position. All moving parts are lubricated by engine oil or filtered gasoline.

Injection pump delivery can be changed to meet requirements of a particular engine by changing the plunger cam form to increase or decrease its stroke, and by changing the plunger diameter. The system is suitable for either manifold or direct cylinder injection, though nozzles for direct injection would be more expensive.

BOOKS ...

MANAGEMENT CONTROL IN AIR-FRAME SUBCONTRACTING, by Neil E. Harlan, published by Harvard Business School, Division of Research, Soldiers Field, Boston 68, Mass. Price, \$1.00. This book deals with the problem of establishing a system of management control when a part of a production job is lifted from the plants of a prime contractor in the airframe industry and placed in the hands of a subcontractor. A companion volume, published simultaneously, covers subcontracting policies in the same industry. The author examines some specific approaches to the problem of controlling quality, delivery, and cost. His conclusions should be of interest not only to prime contractors and subcontractors in the airframe industry, but also to executives in other industries who are involved in the procurement of complex technical products.

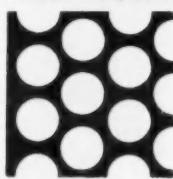
SYMPOSIUM ON HIGH-PURITY WATER CORROSION, published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price, \$1.75. High-purity water and its corrosive effects under various conditions are discussed in the five papers which make up this symposium. High-purity water is defined by F. N. Alquist, one of the contributors, as a water free of all solids, liquids, and gases. In terms of measured electrical resistance, other contributors report using water in the range of 1 million ohm-cm resistance at temperatures up to 750 F. The symposium is generally illustrated and four of the five papers include bibliographies.

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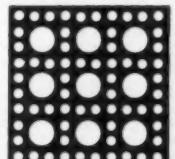
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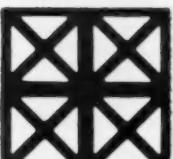
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KEARNEY & TRECKER
MILWAUKEE

Czechoslovakia Motor Industry

(Continued from page 57)

method of coupling is acknowledged to be more costly than universal joints, but is justified on the grounds of technical merit.

The 155 cu in. aircooled V-8 engine is already in quantity production for a 2 1/4-ton truck, but here again economy is sacrificed to advanced conception. For example, the thin and finely-spaced cooling fins on the individual cast iron cylinder barrels are ma-

chined from the solid. Yet some improvement is anticipated, as Tatra is experimenting with shell molding for these components. It is hoped that eventually cast aluminum cylinders with chrome-plated bores will be used.

An apparent conflict in outlook between military authorities and engineers is one of the factors that has hampered the productivity of Czechoslovakia's State-run motor industry.

It is understood that in the past Army officers have called for cross-country vehicles of unusually complex construction, regardless of cost considerations. During the peak cold-war period their specifications went unchallenged, but now production engineers are seeking a bigger voice in selecting designs.

To this the government planners are listening more sympathetically, for emphasis has shifted from military preparedness to an export drive into competitive markets. For this reason, too, Czechoslovakia's limited resources for new investment are being concentrated at the Skoda plant in Mlada Boleslav, since the Skoda 440 sedan made there is felt to have the greatest selling potential.

At present this factory has a total payroll of 7500 (of whom 6000 are productive workers), and is turning out 100 cars a day. Considerable reorganization and modernizing are under way, and by 1960 employment is expected to reach 10,000 and daily production 220.

The Skoda 440 is a small two-door car with all-independent suspension featuring a chassis frame comprising a single tubular spine housing the propeller shaft. A Y-form extension in front cradles the engine, while the driven rear wheels are carried on swing axles whose housings terminate in forks linked to the rigid differential bolted to the backbone tube. The engine is a 64 cu in. four-cylinder unit made largely from aluminum castings.

Several aspects of the chassis design are conceived from the standpoint of low production and assembly costs, such as the pressed steel axle housings, single transverse leaf springs at front and rear, and the simple body-attachment arrangement. Extensive use of aluminum is said to be justified by the ease of machining, long tool life, and the saving in weight (the bare engine weighs only 275 lb). Czechoslovakia has built up a substantial smelting capacity for aluminum, and abundant supplies of ore are obtained from Hungary and Yugoslavia.

But many of these economies are not yet realized, for output is still too small. In fact, it is reliably estimated that the present production cost of one car is higher than its selling price, which is necessarily fixed at a competitive level in western markets. At present the nationalized factory is absorbing the loss in anticipation of future profits to be made when the break-even production figure is

(Turn to page 138, please)



The "Extras" that became "Regulars"

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- AUTOMATIC RESET CIRCUIT BREAKERS
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Time was, when FASCO automotive components such as these were considered only as "extras." But they served their purpose so well and contributed so much to over-all performance and customer satisfaction—that one by one, they have been adopted as standard equipment by America's leading manufacturers of cars and trucks . . . a fine tribute to FASCO engineering skill and product dependability.

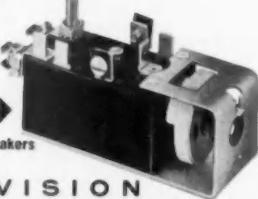
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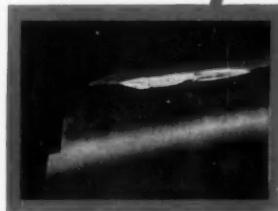
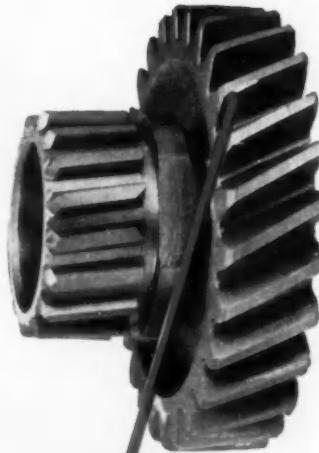
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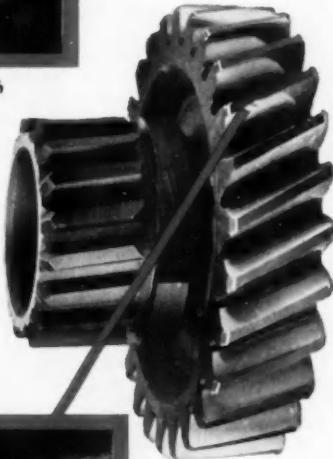
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Gear honing does four important things:

- Smooths off the swaged or raised metal surrounding tooth nicks.
- Eliminates burrs.
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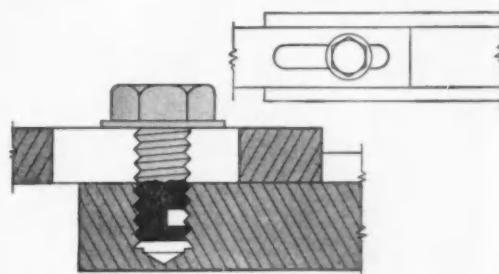
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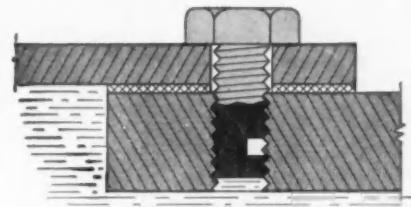
In addition, use of Nylok bolts eliminates lost motion of assembling extra locking devices or expensive wiring. They can be hand wrenching or power driven to minimize fastening time—a tremendous asset in high-volume production runs.

Locking is accomplished by means of a permanent nylon insert in the body of the bolt. This pellet wedges opposite mating threads together to form a vibration-proof lock. There is no damage to threads or seating surfaces, and the insert's resiliency allows fasteners to be adjusted and re-used repeatedly. Further, when properly seated, the nylon insert effectively blocks fluid flow around the helix of the threads. Even relatively soft materials can be locked to a threaded member using Nylok bolts.

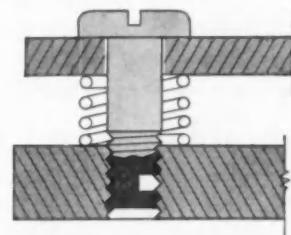
When you specify Republic Nylok Bolts you secure the double protection of Nylok locking plus Republic quality, built into each fastener from raw ore to finished product. To find out how you can take full advantage of this ideal combination, contact your Republic representative. Or mail the coupon for further information.



ADJUSTMENT problems like this movable plate are readily solved using Nylok bolts. The nylon pellet allows bolt to be backed off and re-tightened without damage to threads, seating surfaces or holding power. Unaffected by age, immune to fungus, pellet won't dry out or shrink.



LIQUID SEALING properties of the Nylok bolt are demonstrated here. Nylon pellet, seeking to regain its original shape, effectively interrupts space between non-loadbearing surfaces of mating threads. Escape of fluid along helical thread path is blocked. Nylon's resistance to moisture and ordinary solvents assures permanence of seal.



VIBRATION has no effect on the locking characteristics of Nylok bolts, even when not wrenching tight as shown here. Secure grip is provided by nylon pellet permanently imbedded in fastener body. Continual pressure of resilient nylon forces tight metal-to-metal lock between mating threads opposite the pellet.

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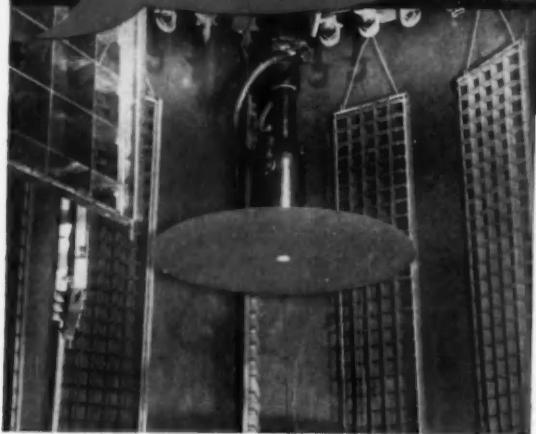
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Not only big industrial manufacturers like G. E. . . . Whirlpool-Seeger . . . Westinghouse and Republic Steel, but little plants, too, are using **RANSBURG NO. 2 PROCESS** in their finishing departments to help keep mounting manufacturing costs in line.

A typical example is Melrose Lighting Company, Philadelphia. They make industrial fluorescent lighting fixtures and employ only 25 people.

Formerly, according to F. Homer Hagaman, owner Melrose Lighting, when their fixture louvres were hand sprayed, they painted only 70 pieces per hour. Now, with Ransburg Electro-Spray, he reports they get over 200 per hour.

Production on the fixture end parts jumped from 400 pieces per hour by hand spray to over 2000 an hour electrostatically—a 400% increase!

Along with improving quality of the work, stepping up production, and cutting labor costs, Melrose is enjoying a 50% paint savings.

Let us show you how Ransburg No. 2 Process can lower YOUR painting costs. Write for our new No. 2 Process brochure on electrostatic spray painting. Numerous production-line examples show how other manufacturers are cutting finishing costs . . . increasing production . . . and improving the uniformity and quality of their work with Ransburg equipment.

Ransburg
ELECTRO-COATING CORP.
 Indianapolis 7, Indiana

RANSBURG

Czechoslovakia Motor Industry

(Continued from page 134)

passed some time next year.

As yet there is little automation, although there is a large number of locally-built, multi-spindle units for the major aluminum castings like the engine block, cylinder head and clutch housing. However, a six-station automatic transfer line for machining the valve areas of the cylinder head is now being installed, and when the line is extended to 18 stations it will handle all operations on this component. Other transfer machines are expected to follow.

Body production is one of the bottlenecks, and major alterations are under way in this section. The press shop has recently been fitted with two 1000-ton and four 500-ton units obtained from Russia, and one 500-ton machine of Czech manufacture. Sheet steel is mostly Czech, although higher-quality material imported from West Germany is favored for panels requiring deep draws.

Part of the welding section has already been modernized, and a number of hydraulically operated jigs, fixtures and clamps are in use. Most advanced of these is a six-station merry-go-round machine for spot-welding the roof and the door and window frames. Here the fixtures with power clamping and location are carried on a 30-ft-diameter rotating table, with transformers suspended from an overhead circular track. Small parts are stocked in the center.

Body painting and finishing are still backward, with this work performed in a separate four-story building. Bodies in white on dollies are raised by a small freight elevator to the top floor, where they are washed, hand-sprayed with primer, and baked. The elevator takes them down to the next level for wet sanding and under-coating, and thence to the lower floors for final spraying and finishing.

Bodies are then transported on trailers by a road winding through the factory grounds to the start of the trim line in the upper level of the main assembly hall about a quarter of a mile away. This complex process is to be streamlined, and future plans provide for an outdoor conveyor to span the distance between the two buildings.

Chassis assembly is more business-like, with the conveyor moving past (Turn to page 142, please)

Giant LeTourneau Sno-Freighter built on rugged backbone of

SHELBY SEAMLESS MECHANICAL TUBING



Another LeTourneau "train," also constructed with Shelby Seamless Mechanical Tubing, maneuvers through the streets of Longview, Texas. The uncovered control car reveals its 3,500-gallon fuel tank and its two diesel engines which generate electricity for driving the wheel motors.

The LeTourneau Sno-Freighter is a huge six-section cargo carrier specifically designed to travel over ice, frozen or compacted snow, bulldozed trails, or rough brush land. It is presently in active use hauling fuel and other strategic materials to radar stations along the Arctic Coast.

The Sno-Freighter "train" consists of a power control car and five cargo cars, each with a capacity of 25 tons. Two 400 H.P. diesel-electric generating sets on the power control car supply electrical power to the 24 drive wheels, each of which has a powerful electric motor tucked into its rim. Thus, each wheel drives independently of the others, making it practically impossible for the carriers to get stuck in sand, snow, or swamp.

All of the Sno-Freighter's car frames are constructed of Shelby Seamless Mechanical Tubing in diameters from 2 inches to 8 inches. In addition, each of the cars is coupled to the one preceding it through a universal joint and

a long steel tube of Shelby Seamless. This constitutes the steering mechanism, causing each vehicle automatically to track the car ahead of it. The operator of the Sno-Freighter steers only the two front wheels of the power control car.

There are many good reasons why Shelby Seamless Mechanical Tubing was chosen for the supporting framework of this magnificent mechanical marvel. Primarily, it offers the ultimate in strength and rigidity in proportion to its size and weight. Secondly, it is shock-absorbent, uniform throughout, dimensionally accurate, and possesses excellent machining and superior welding properties. It is produced under rigid standards, and is available in a generous range of diameters, wall thicknesses, various shapes and steel analyses. And it can be fitted to your specifications, regardless of what they are. Contact our engineers. They will be happy to help you adapt Shelby Seamless to your requirements.



Sno-Freighter in action in northern Alaska. The control cab is 17 feet high; the decks of the cargo carriers are 8½ feet high. Speeds range from 0 to 15 MPH.

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
(Tubing Specialties)

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

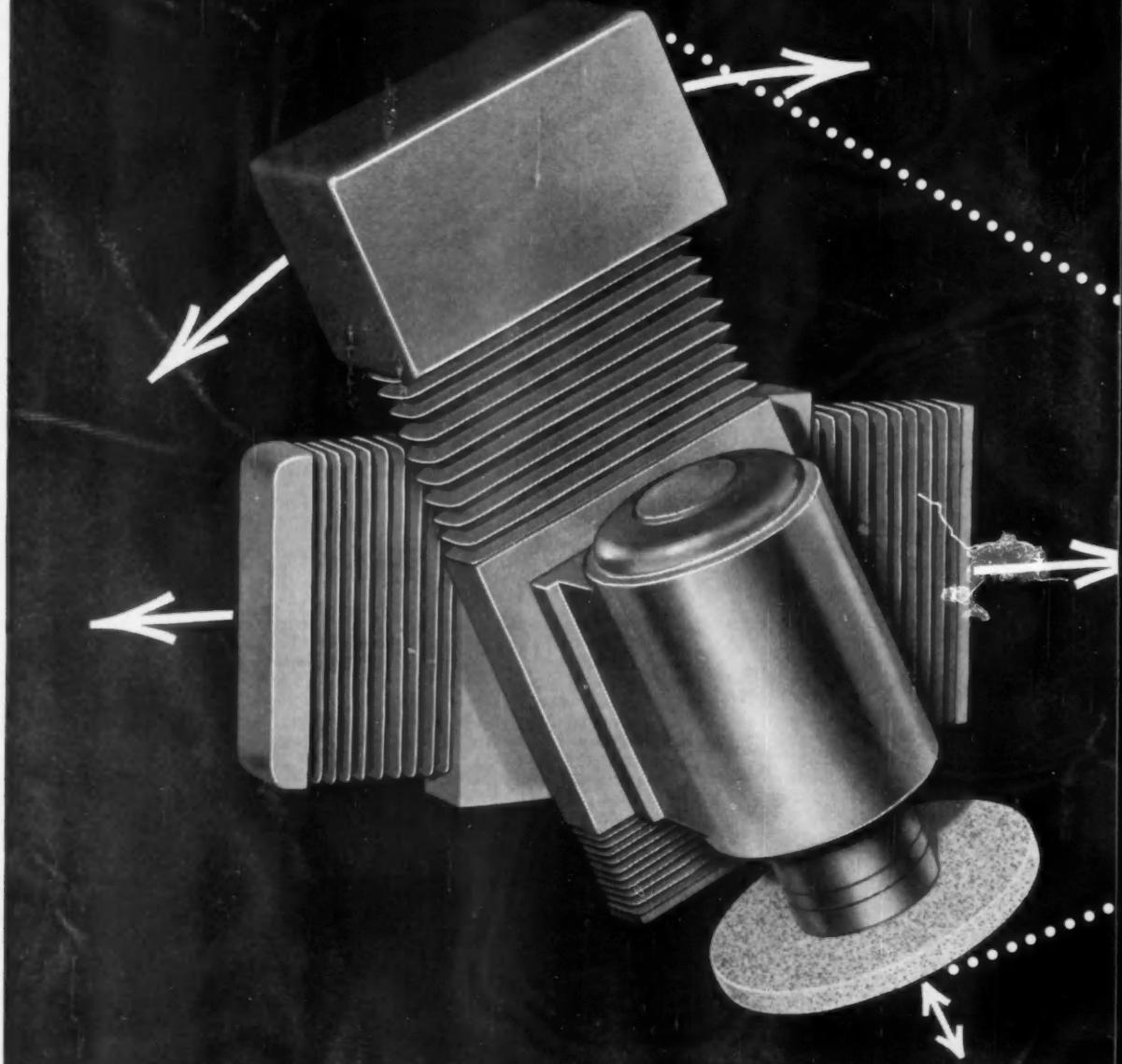


SHELBY SEAMLESS MECHANICAL TUBING

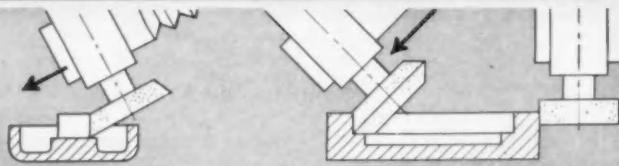


UNITED STATES STEEL

PRECISION GRINDING



Diagrams show typical applications
of Frauenthal Standard Slide Units
to a variety of grinding problems.



at any angle!

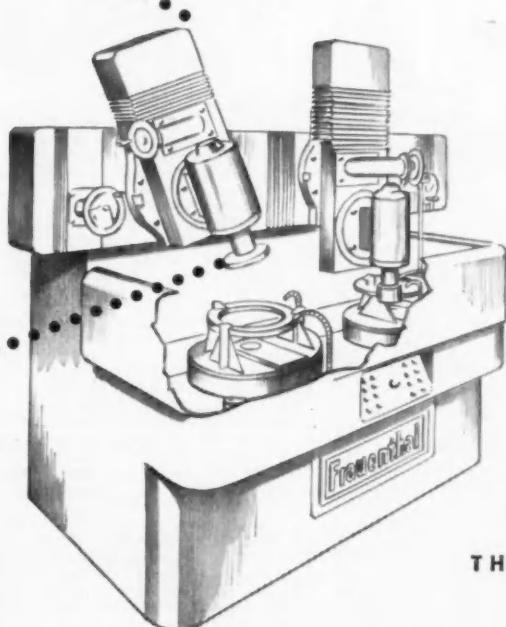
Frauenthal's creative engineering Now makes available Standard Slide Units in any number of combinations for production grinding applications . . .

IT IS NO LONGER NECESSARY to absorb special engineering and design costs when Frauenthal Standard Slide Units — plus a variety of grinding spindles — can be assembled to machine bases appropriate to a particular job. And these standard slides in single or multiple units can be arranged in an infinite number of spindle positions to accommodate an endless variety of simultaneous or sequenced, automatically controlled grinding operations.

What's more, you get all the advantages of

Frauenthal's advanced engineering and design experience—proven on single and multiple-head grinders used on special production jobs. For example: parts for jet engines, diesel and automobile engines, tanks, gun mounts, radar units, large and small diameter precision bearings and machine tool components.

As illustrated here, this model of the versatile grinding compound shows how the Frauenthal Standard Slide Unit can be adapted to approach the work from any desired angle.

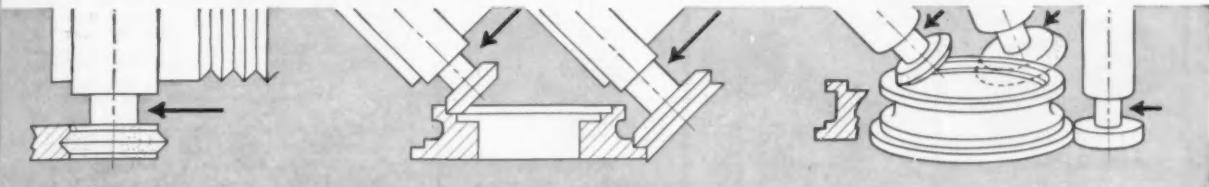


Here's a typical Frauenthal Double Head Vertical Spindle application utilizing two of the Frauenthal Standard Slide Units shown on the opposite page. Although applied to a particular grinding situation, these slide units retain versatility for angular positioning. Frequently, as indicated in panels 2 and 4 at the bottom of the page, diameters and adjacent surfaces are ground at one time with a single wheel dressed to the proper contour.

Send a print of your "problem grinding part" and our engineers will show you how to apply Frauenthal Standard Slide Units to solve the problem. Include in your letter pertinent production information — number of pieces, etc. Be sure to investigate the latest Frauenthal Vertical Grinders with Standard Slide Units. For complete details, contact Frauenthal of Muskegon.

Frauenthal Division
THE KAYDON ENGINEERING CORP.
MUSKEGON, MICHIGAN, U. S. A.

F-256



Czechoslovakia Motor Industry

(Continued from page 138)

stocks of components at the end of right-angled machining and sub-assembly lines. Painting is simplified by spraying the completed chassis and engine as a unit.

Also unusual is the start of the final assembly line, where the chassis are hoisted to a shoulder-high wooden platform beneath the conveyor on

the floor above carrying finished bodies. At the first six stations after the body drop the cars are moved sideways at a convenient height for the workers to reach the chassis and underbody. Then they come to a ramp where one rear wheel is held but allowed to pivot, while the front end swings down and forward through 90 degrees on a quadrant of rollers, after which the cars roll onto an end-to-end conveyor at ground level. This arrangement saves floor space, which is at a premium at the Skoda plant.

Officials of the Ministry of Automobile Industry stated that the target of 100,000 passenger cars annually is a final figure for Czechoslovakia. It is felt that the home market with only 13 million population could not regularly absorb even this number, and that at least half the output will have to be exported to sustain this volume. They also calculate that substantial economies will accompany the planned production growth, and that the selling price can be cut to boost sales. As this happens, priorities in investment allocations will be shifted from Mlada Boleslav to the truck and bus factories to enable them to catch up.

Small Motor . . . BIG Idea
FOR YOUR MOTOR-DRIVEN PRODUCT

This motor is representative of the many Lamb Electric motors specially engineered to provide:

- (1) the dependable power and smooth, efficient operation required for top product performance.
- (2) the low weight and compactness required for easy portability and good product appearance.

These advantages are standard with Lamb Electric Motors, at no increase in cost, because our plant is equipped and organized to custom manufacture on a volume basis. May we demonstrate?

THE LAMB ELECTRIC COMPANY • KENT, OHIO
In Canada: Lamb Electric—Division of Sangamo Company Ltd.—Leaside, Ontario

Lamb Electric
SPECIAL APPLICATION
FRACTIONAL HORSEPOWER MOTORS



Army tank ventilating blower motor.



Motor parts for portable electric tools.



Motor for air conditioning applications.

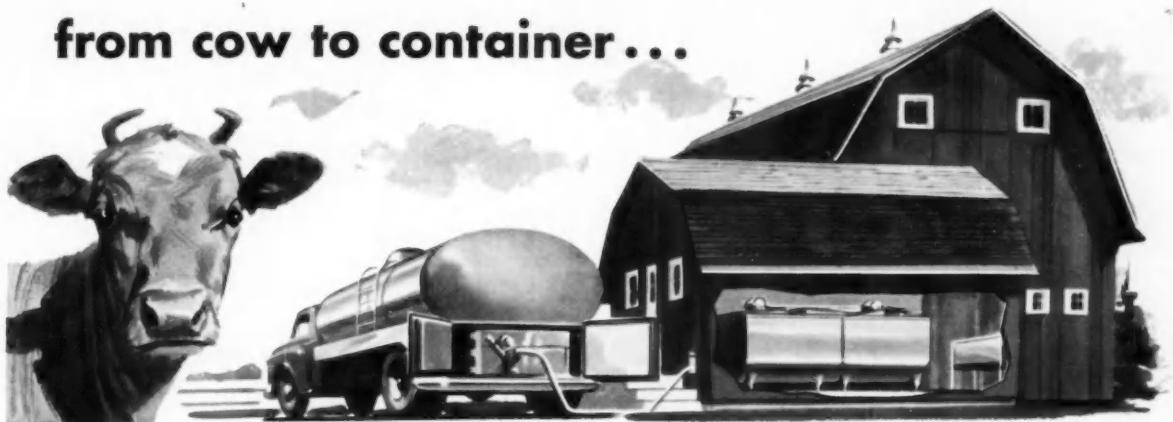
BOOKS ...

RELAXATION PROPERTIES OF STEELS AND SUPER-STRENGTH ALLOYS AT ELEVATED TEMPERATURES, published by American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa. Price, \$4.00. This report, seventh in a current series, summarizes relaxation strengths for low-alloyed Mo-, Cr-, and V-bearing steels; 12 per cent Cr-type steels, super-strength alloys, and cast iron. Temperatures covered range from 750 to 1100 F for steels and from 1200 to 1500 F for super-strength alloys. Tabulated data also include chemical composition, heat treatment, mechanical properties at room temperatures, and limited creep data.

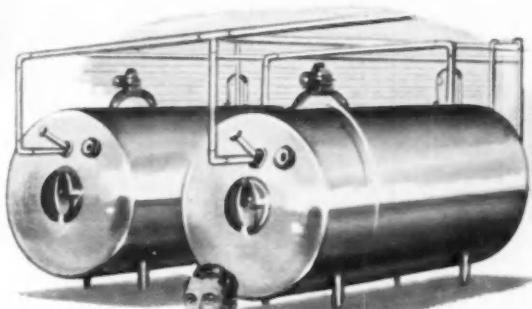
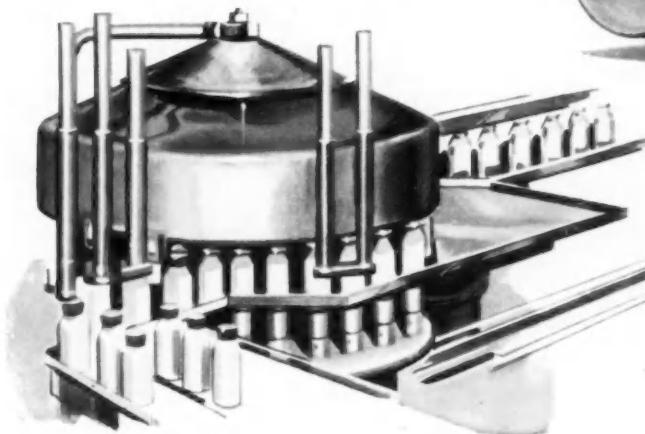
1956 SUPPLEMENTS TO BOOK OF ASTM STANDARDS, published by American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa. Price, \$4.00 per part; \$28.00 for complete set. To keep the Book of ASTM standards up to date, the Society issues supplements in the years between new editions. The 1956 supplement, issued in seven parts, gives in their latest form 420 specifications, tests, and definitions which either were issued for the first time in 1956 or were revised since their appearance in the 1955 Book. The entire supplement is divided as follows: Part 1—Ferrous Metals; Part 2—Non-Ferrous Metals; Part 3—Cement, Concrete, Ceramics, Thermal Insulation, Road Materials, Waterproofing, and Soils; Part 4—Paint, Naval Stores, Woods, Sandwich Constructions, Fire Tests, Wax Polishes; Part 5—Fuels, Petroleum, Aromatic Hydrocarbons, Engine Antifreezes; Part 6—Rubber, Plastics, Electrical Insulating Materials; Part 7—Textiles, Soap, Water, Paper, Adhesives, Shipping Containers, Atmospheric Analysis.

METHOD FOR REDUCING THE EFFECT OF BAROMETRIC PRESSURE IN MEASUREMENT OF OCTANE NUMBER, published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price, \$1.50. To reduce the effect of barometric pressure on octane ratings, the National Bureau of Standards conducted a series of altitude chamber tests, in which inlet temperature and compression ratio were adjusted in combination to produce more uniform compression temperature-density relationships. The final results are presented in the form of tables of empirically determined operating conditions that will lead to substantially the same octane number at any atmospheric pressure between 21.0 and 30.5 in. Hg absolute.

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safeguards the purity
of your dairy products



Dairymen and milk-product plant operators know that Stainless Steel is the only metal that year after year effectively resists acid corrosion. It can easily be kept clean and sterile and imparts no odor in contact with the product.

Through all the stages of milking, transportation, processing and packaging Stainless Steel completely safeguards the delicate flavor and highly sensitive qualities of milk and cream, and milk products like butter, cheese, ice cream and powdered milk.

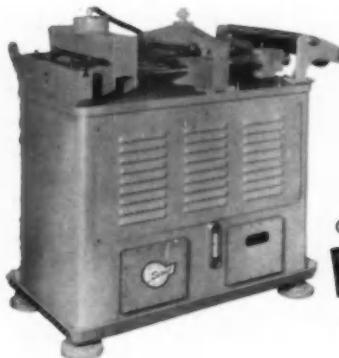
The delicious taste of your dairy products and the assurance of their purity is due to the dairyman's extreme care and scientific methods and the use of Stainless Steel equipment.

McLOUTH
STAINLESS
STEEL

For the product you make today and the product you plan for tomorrow specify McLoth high quality sheet and strip Stainless Steel



McLOUTH STEEL CORPORATION DETROIT, MICHIGAN • MANUFACTURERS OF STAINLESS AND CARBON STEELS

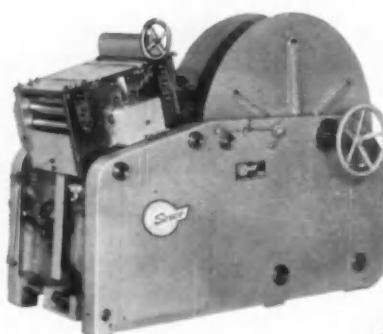


Original

Punch Press Gripper Feed

Pinch Gripping Assures Scuff-Free Feeding

Cradle or
Straightener
available as
separate units

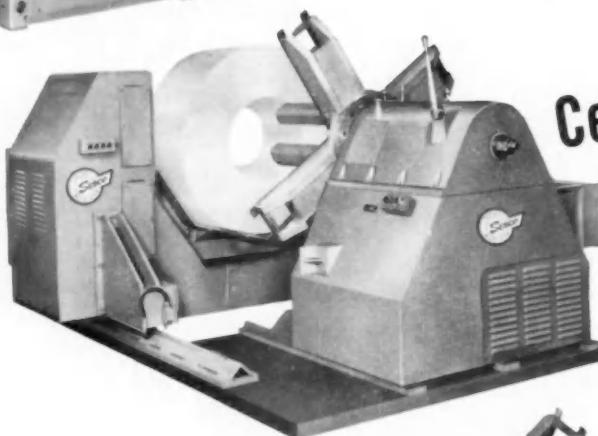


Sesco coil handling equipment is
completely powered at a controlled
rate to customer specifications

Combination Cradle and Straightener

Power-Lift Loader

It's a real
production booster



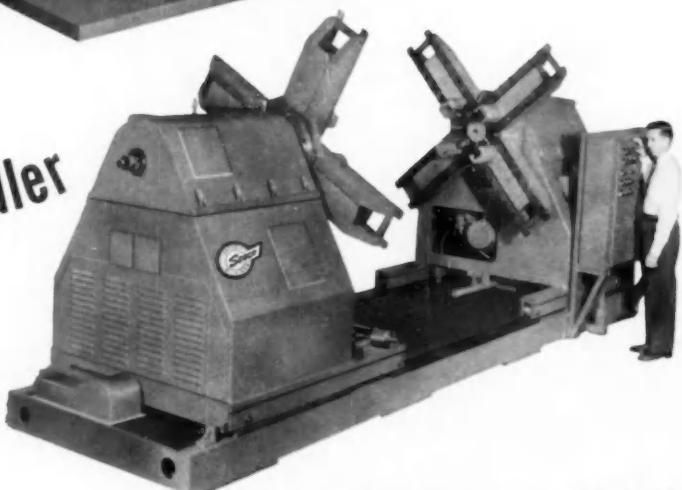
Centering Reel

The first of its kind

TWIN-IN ACTION coil handler

Sesco's broad experience enables
its staff to render assisting
services in the handling of
coils and parts for the
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and press room equipment

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BOOKS...

NATIONAL STANDARDS IN A MODERN ECONOMY, edited by Dickson Reck, published by Harper & Brothers, 49 East 33 St., New York 16, N. Y. Price, \$5.00. This book is both a review of the evolution of standards and an evaluation of their role in our economy. Many of the contributors to this volume are leaders in the private and public organizations that have been responsible for the development of modern standards to the point where they are among the basic components of modern life. Among the subjects covered in this exhaustive survey are the legal aspects of the use of standards, their relation to industrial self-government, and their impact upon individual enterprise as well as upon the economy as a whole. Standardization, as this book points out, is no longer the exclusive concern of the engineer, but is fast becoming a management function as well as a planning and operating tool. For this reason, this book should be required reading for every executive.

INDUSTRIAL VISION, by H. W. Hoffstetter, published by Chilton Co., Chestnut and 56th Streets, Philadelphia 39, Pa. Price, \$10.00. This comprehensive analysis and review of industrial vision is designed to familiarize the reader with the visual problems and characteristics of occupational groups. The author attempts to relate vision, visual testing, and visual skills to industrial performance, production, and safety. He interprets vision in terms of visual acuity, extraocular muscular imbalance, color vision, stereopsis, and visual field anomalies. The importance of the subject is pointed up by the fact that over 10,000 men and women permanently lose part of the vision of one or both eyes as a result of industrial accidents each year. This book will be a valuable guide for students, physicians and nurses, ophthalmologists, opticians, and safety directors.

FUNDAMENTAL MATHEMATICS, by T. L. Wade and H. E. Taylor, published by McGraw-Hill Book Co., 330 West 42 St., New York 36, N. Y. Price, \$4.75. This book is primarily intended to provide an adequate foundation for the study of algebra, trigonometry, and analytic geometry, but it also treats those basic topics in mathematics that have come to be considered part of the education of a well-informed person. The authors have attempted to avoid a superficial treatment of any of the subjects covered. Only selected topics from geometry which are of particular interest in general education (similar triangles, the Pythagorean theorem, and formulas for areas and volumes) are included. The explanations are relatively complete, and the meanings of concepts and symbols are carefully explained.

AN ENCYCLOPEDIA OF THE IRON AND STEEL INDUSTRY, compiled by A. K. Osborne, published by Philosophical Library, Inc., 15 East 40th Street, New York 16, N. Y. Price, \$25.00. This 558-page encyclopedia provides a concise description of the materials, plants, tools, and processes used in the iron and steel industry, as well as in allied industries. It covers every aspect of the industry, from the preparation of the ore down to the finished product, and defines technical terms used in the literature. The volume includes five appendices which list conversion tables, weights and measures, properties of steel, signs and symbols, and societies related to the iron and steel industries. It is well illustrated with photographs, drawings and charts.



Body Parts and Moulding Formers...

*offer production of
400 to 800 parts per hour*

The new AHS (Automatic High Speed) machine combines stretch and compression methods of Radial Draw Forming to produce parts to accurate and permanently stable contours. These machines are automatic fed, automatic loading and automatic ejecting. The BATH machine provides designers with greater freedom in shapes and substantially lower production costs. Initial capital investment is lower with these machines than in other methods of manufacture.

Write for literature covering *all* the features of the new BATH AHS machine.



THE CYRIL
BATH
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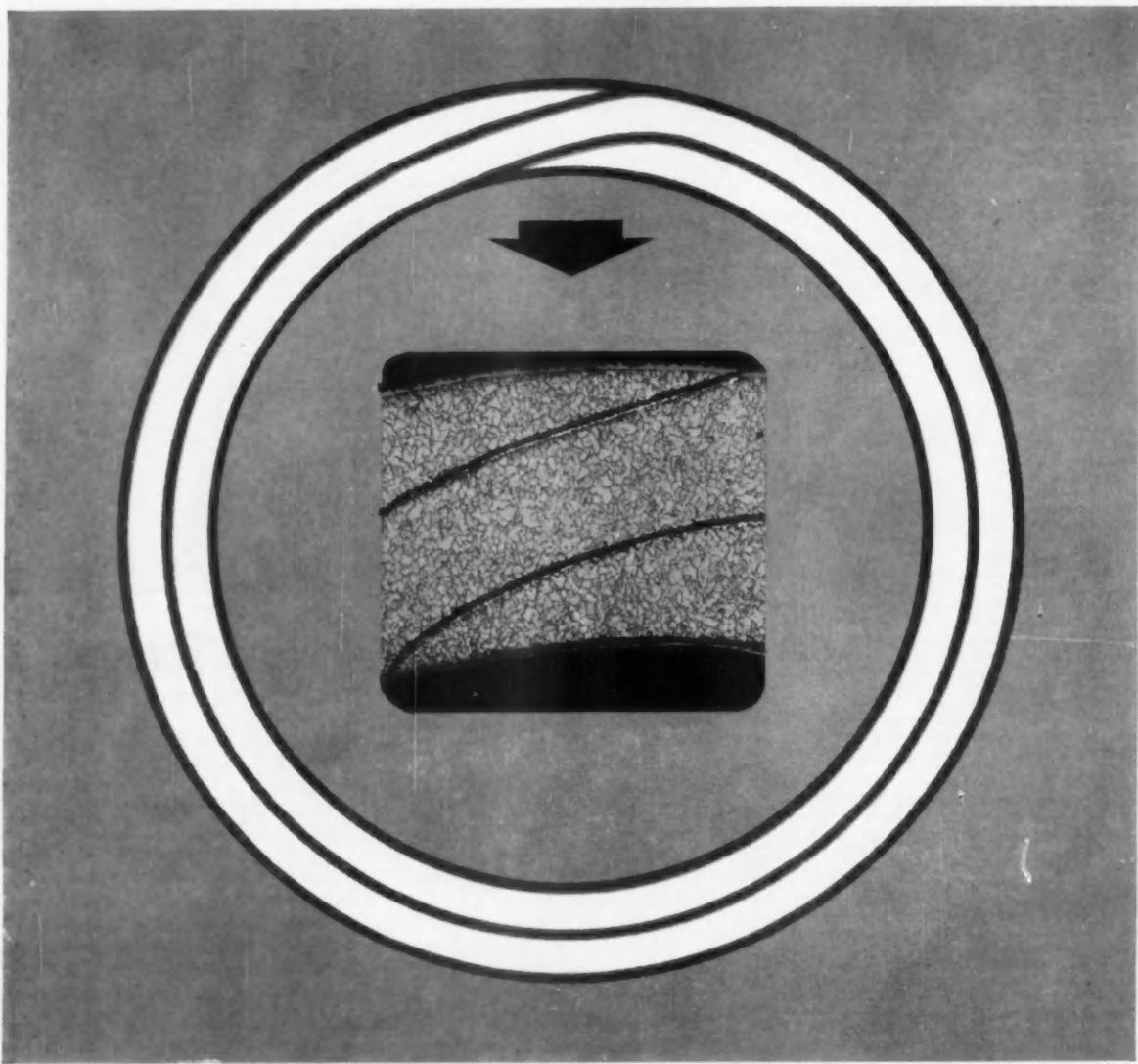
32332 AURORA ROAD • SOLON, OHIO

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Manufacturers of Radial Draw Formers • Dies • Tools
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Hardtop auto body
roof side rails
with incorporated
drip moulding and
similar parts
involving changing
cross section and
offsets throughout
the curvature are
suitable for
production on BATH
AHS machines.

Only double-walled Bundyweld



With Bundyweld's beveled edges and single close-tolerance strip, there's no inside bead at joint, as shown in photomicrograph (inset, above). The tubing is uniformly smooth,

inside and out. Bundyweld fabricates easily; can be bent to shortest radii. Copper coating, inside and out, facilitates soldering and brazing operations.

WHY BUNDYWELD IS BETTER TUBING



Bundyweld starts as a single strip of copper-coated steel. Then it's . . .



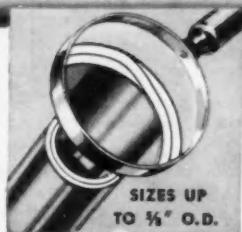
continuously rolled twice around laterally into a tube of uniform thickness, and



passed through a furnace. Copper coating fuses with steel. Result . . .



Bundyweld, double-walled and brazed through 360° of wall contact.



SIZES UP
TO $\frac{5}{8}$ " O.D.



NOTE the exclusive Bundy-developed beveled edges, which afford a smoother joint, absence of bead, and less chance for any leakage.

Steel Tubing meets every automotive fabrication test!

Bundy alone brings you a double-walled steel tubing made from a single metal strip—for the utmost in strength, durability, and leakproof performance

Automotive engineers have long relied on tough, leakproof Bundyweld Tubing for oil, fuel, and hydraulic lines in cars, trucks, buses, and tractors. Double-walled Bundy® Tubing's extra-sturdy construction and ease of fabrication have led to its use in an ever-increasing number of automotive applications.

Bundyweld is used in 95% of today's cars, in an average of 20 applications each.

This didn't just happen; there are two very good reasons for Bundy's overwhelming leadership in the automotive tubing field...

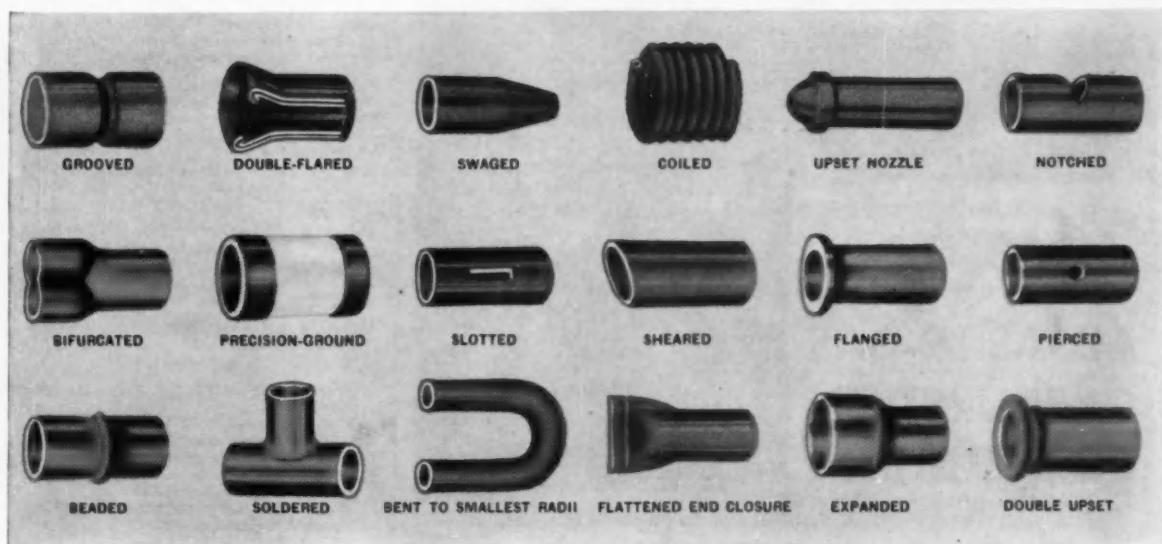
The tubing itself: Bundyweld is the only tubing double-walled from a single metal strip, with exclusive Bundy-

developed beveled edges. SAE 1010 steel is copper-bonded throughout 360° of wall contact into a strong, lightweight, beadless tubing. Wall thickness and concentricity are accurate, uniform. Ultimate yield strength, tensile strength, and fatigue limit are exceptionally high.

Bundy's plus service: Bundy backs up its unique Bundyweld Tubing with a staff of engineering experts who take pride in helping solve tricky tubing problems, with unexcelled fabrication services, with custom-packaging of orders, and fast, *on-schedule* deliveries.

For more information, or help with your special tubing problems, call, write, or wire us today!

BUNDY TUBING COMPANY • DETROIT 14, MICHIGAN



Shown above are but a few of the fabrication operations which are possible with Bundyweld Steel Tubing. Many of these, and others not shown, were developed through solving a

specific problem brought to us by a customer or prospect. At any stage in the development of your product, Bundy invites you to take advantage of this design service.

BUNDYWELD® TUBING

DOUBLE-WALLED FROM A SINGLE STRIP

Bundy Tubing Distributors and Representatives: Cambridge 42, Mass.: Austin-Hastings Co., Inc., 226 Binney St. • Chattanooga 2, Tenn.: Pearson-Deakin Co., 823-824 Chattanooga Bank Bldg. • Chicago 32, Ill.: Lapham-Hickey Co., 3333 W. 47th Place • Elizabeth, New Jersey: A. B. Murray Co., Inc., Post Office Box 476 • Los Angeles 58, Calif.: Tubesales, 5400 Alcoa Ave. • Philadelphia 3, Penn.: Rutan & Co., 1717 Sansom St. • San Francisco 10, Calif.: Pacific Metals Co., Ltd., 3100 19th St. • Seattle 4, Wash.: Eagle Metals Co., 4755 First Ave., South Toronto 5, Ontario, Canada: Alloy Metal Sales, Ltd., 181 Fleet St., E. • Bundyweld nickel and Monel tubing are sold by distributors of nickel and nickel alloys in principal cities.

More Government Contract Awards

THIS latest list of Government prime contracts that have been awarded covers the period from November 28 to December 26, 1956. Items included in this list are for various types of automotive military equipment, including tanks, motorized gun carriages, trucks, airplanes, automotive components and spare parts, automotive maintenance equipment, etc.

AEROQUIP CORP., Jackson, Michigan
Nut-tube coupling—598,000 ea.—\$451,592

AINSWORTH MANUFACTURING CORP., Detroit, Michigan
Automotive spare parts—4329 ea.—\$269,870

AIRESEARCH MANUFACTURING CO., Div. The Garrett Corp., Los Angeles, Calif.
Valve assembly, oil cooler—3 items—\$100,572

AIRESEARCH MANUFACTURING CO. OF ARIZONA, Div. The Garrett Corp., Phoenix, Arizona
Starters, pneumatic, aircraft engine—\$624,456

AMERICAN MOTORS CORP., Detroit, Michigan
Automobiles—6 ea.—\$10,098

ATLAS INDUSTRIES, INC., Woodville, Ohio
Shaft, final drive gear, with studs for M26, M46 and M47 medium tanks, contract DA-33-019-ORD-2288 PNT 61-7—\$92,489

AVCO MANUFACTURING CORP., Crossley Div., Nashville, Tenn.
Services and materials to overhaul R4D-5/6, R4D-8/8Z aircraft—\$509,857

AVCO MANUFACTURING CORP., Lycoming Div., Stratford, Conn.
Preproduction effort required to establish capacity and capability to produce model T53 engine—\$2,900,000
Product improvement on T53 engine—\$1,140,000
Conduct study of application of gas turbine power packages—Job—\$49,272

AVCO MANUFACTURING CORP., Lycoming Div., Williamsport, Pa.
Special tools and spare parts for series 0290-G aircraft engines—246 ea.—\$86,815

THE B. G. CORP., Ridgefield, New Jersey
Spark plugs—Various—\$340,921

THE BARDEN CORP., Danbury, Conn.
Bearings—224,600 ea.—\$320,904

BELL AIRCRAFT CORP., Helicopter Div., Fort Worth, Texas
YH-40 helicopters—\$1,500,000

BENDIX AVIATION CORP., Bendix Products Div., South Bend, Indiana
Fuel control assys.—Various—\$2,456,137
Overhaul and repair pumps—450 ea.—\$241,502
Wheel assy., 20.00-20; brake assy. (for 20.00-20 wheel, C133A aircraft)—\$1,305,033

BENDIX AVIATION CORP., Red Bank Div., Eatontown, New Jersey
Generators, 20 KVA, AC regulators, voltage, panels, control, AC for F104A aircraft—\$1,137,791

BENDIX AVIATION CORP., Utica Div., Utica, New York
Starters—189 ea.—\$245,511

BOEING AIRPLANE COMPANY, Seattle, Washington
Modification of C-97-4 and C-97-5 mobile training units—\$327,953
Facilities for the production flight testing of B-52 aircraft—\$4,706,000
KC-135A fuselage—\$98,231
Model KC-135A airplanes—\$50,000,000
Hydrostatic test of KC-135A fuselage—\$1,487,920

BOEING AIRPLANE CO., Wichita, Kansas
Items to be used on B-47, B-29, B-50, B-52 and C-97 aircraft—Various—\$173,538

BORG-WARNER CORP., Peseo Products Div., Bedford, Ohio
Hydraulic gear pump assembly—10 items—\$56,202
Pump rotary power driven gear type horizontal—7 items—\$172,061
Body, diaphragm, filter assys.—Various—\$171,714

CANFIELD TOOL AND DIE CO., Detroit, Michigan
Automotive spare parts—Various—\$65,506

CESSNA AIRCRAFT COMPANY, Wichita, Kansas
L-19A airplane—\$58,172
(Turn to page 150, please)



Use
→
ALGAS LP-GAS
CARBURETION
EQUIPMENT

What This Owner Thinks!

"I don't know how I ever operated without it," says the owner of Stone Rock Company in commenting on ALGAS LP-Gas equipment used on his pick-up truck. "It gives me the kind of performance that I must have and operating costs have been cut more than half." Whether the equipment is pick-up trucks, buses, or heavy-duty over the road vehicles for long hauls, you can depend on ALGAS LP-Gas equipment to always give you operating savings that you can see.

Write today for information on ALGAS LP-Gas carburetion equipment.



AMERICAN LIQUID GAS CORPORATION

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Passenger cars



Trucks



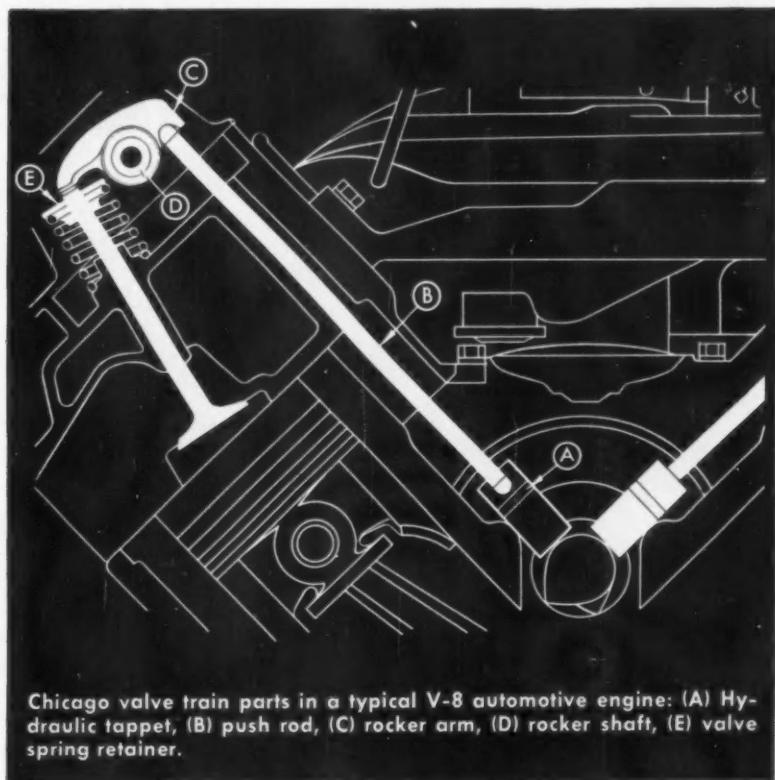
Tractors



Diesels



Aircraft



Chicago valve train parts in a typical V-8 automotive engine: (A) Hydraulic tappet, (B) push rod, (C) rocker arm, (D) rocker shaft, (E) valve spring retainer.

**When it comes to valve gear,
leading engine makers come to**

CHICAGO

Here at Chicago you'll find a single source for everything you need in valve gear. These specialized facilities are solving problems and saving money for leading engine manufacturers . . . and can do the same for you.

Design and Engineering—at Chicago you'll find valve gear engineering experience in depth . . . men who understand your problems and will work with your engineering staff in designing cam shafts and complete valve gear assemblies for any type of engine.

Manufacturing—Chicago is a leading manufacturer of valve train parts. Our complete line includes precision-made hydraulic and mechanical tappets; push rods in both lightweight tubular and solid styles; valve adjusting screws including new self-locking screws that cut assembly costs; valve spring retainers; rocker arms and rocker shafts.

Testing—we have complete laboratory and engine testing facilities.

For the full story of how we can serve you, write our Tappet Division.

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DIVISION OF STANDARD SCREW COMPANY • ESTABLISHED 1872

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Saves 40% Space! STRONGER, TOO

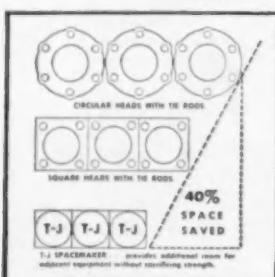
Than Outmoded
Tie Rod Cylinders!



Spacemaker CYLINDERS

Offer All The Extras As Standard!

- NEW exclusive Ingenious Cushion Designs . . . Super Cushion Flexible Seals for Air . . . New Self-Aligning Master Oil Cushion
- Compact design eliminates tie rods, saves up to 40% space
- Proven Performance . . . with Extra High Safety Factor
- Hard Chrome Plated Bodies and Piston Rods (Standard, at no extra cost)
- OIL pressure up to 750—AIR to 200 P.S.I.



You'll find many answers to *automation* in your plant with T-J Spacemaker Cylinders! Designed with years-ahead features for top performance and dependability. Wide range of styles, capacities . . . for all kinds of push-pull-lift operations . . . reduces man-hours and costs! Write The Tomkins-Johnson Co., Jackson, Michigan.

MEMBER OF THE NATIONAL FLUID POWER ASSOCIATION



TOMKINS-JOHNSON

RIVETERS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHERS

NEW LITERATURE . . . send today for new Bulletin with complete details of Spacemaker line.

(Continued from page 148)

CHRYSLER CORP., Detroit, Michigan
Automotive spare parts—Various—\$465,732

CLARK EQUIPMENT COMPANY, Battle Creek, Mich.
Fork lift trucks—4 ea.—\$16,812

THE CLEVELAND PNEUMATIC TOOL CO., Cleveland, Ohio
Strut assys.—8 ea.—\$44,761
Ball bearings, screw assys.—Various—\$88,887

CONTINENTAL AVIATION & ENGINEERING CORP., Detroit, Mich.
Development of AOI 628-1 engines—\$97,793
Concept study of the application of gas turbine power packages to military vehicles—\$49,887

CONTINENTAL MOTORS CORP., Detroit, Michigan
Engineering studies, reports and drawings—Job—\$59,495

CONTINENTAL MOTORS CORP., Muskegon, Mich.
Packette engines—\$200,593
Engines, packette, maintenance data and engineering data—\$1,016,673
Facilities to produce various military engines and parts thereof—\$84,980

COOPER TIRE & RUBBER CO., Findlay, Ohio
Tire, 9.00-16, 8PR, T&B—2066 ea.—\$67,124

CURTISS-WRIGHT CORP., Electronics Div., Carlstadt, New Jersey
Model B-52D flight simulators—\$600,000
C-121C flight simulator—\$1,007,753
Type MB-12A simulators—2 ea.—\$300,000

CURTISS-WRIGHT CORP., Propeller Div., Caldwell, New Jersey
Propeller assemblies (Inst.) and (Spares) controls. All for support of ZS2G-1 airships—\$588,292

CURTISS-WRIGHT CORP., Wright Aeronautical Div., Wood Ridge, New Jersey
Services and material for oil pumps—Various—\$194,925

CUSHMAN MOTOR WORKS, INC., Lincoln, Nebraska
Three wheel motor scooters—1501 ea.—\$1,412,140

HARLEY DAVIDSON MOTOR CAR CO., Milwaukee, Wisconsin

Motorcycle solo 45 cubic inch—418—\$489,062

THE DEUTSCH COMPANY, Los Angeles, California
Nut—\$15,000 ea.—\$75,029

DIAMOND T MOTOR CAR CO., Chicago 25, Illinois
Gear, steering assy.—1060—\$226,374

DOUGLAS AIRCRAFT COMPANY, INC., Long Beach, Calif.
C-133A airplanes—\$8,000,000

DOUGLAS AIRCRAFT CO., INC., Santa Monica, Calif.
Parts for R5D spares—Various—\$101,106
Parts for R6D spares—Various—\$36,333

Cylinder, valve assys.—Various—\$34,081

DOUGLAS AIRCRAFT COMPANY, INC., Tulsa Div., Tulsa, Okla.
Fabrication of B-47 type kits—Job—\$5,800,000

ELASTIC STOP NUT CORP. OF AMERICA, Union, New Jersey
Nut—6,153,000 ea.—\$416,353
Nut, self-locking steel—Various—\$83,995

THE ELECTRIC AUTO-LITE CO., Toledo 1, Ohio
Motor vehicle parts—6535 ea.—\$81,331

Battery, dry charged, 12 volt—39,874 ea.—\$537,492

Motor vehicle parts—585 ea.—\$27,510
Kit, starter switch—22,920 ea.—\$141,856

(Turn to page 152, please)



wheels that whisper tomorrow....

Wheels by Kelsey-Hayes play a vital part in the safer, smoother performance of today's automobiles. Continuous research and engineering improvements, increased production skill—promise even finer wheels by Kelsey-Hayes tomorrow.

Other automotive products by Kelsey-Hayes include: Wheels, Brakes, Hubs and Brake Drums, Power Brakes, Hydraulic Brakes, Transmission Bands, etc.

KELSEY-HAYES

Kelsey-Hayes Company, Detroit 32, Mich. • Major Supplier to the Automotive, Aviation and Agricultural Industries

15 PLANTS / Automotive: Detroit and Jackson, Michigan; McKeesport, Pa.; Los Angeles, Calif.; Windsor, Ontario, Canada
Aviation: Jackson, Michigan; Springfield, Ohio—2 plants—(SPECO Aviation Division); Utica, New York—4 plants
—(Utica Drop Forge and Tool Division) • **Agricultural:** Davenport, Iowa (French & Hecht Farm Implement and Wheel Division)

(Continued from page 150)

FAIRCHILD ENGINE AND AIRPLANE CORP., Fairchild Engine Div., Long Island, New York
Modify, develop, and manufacture J-44-R-26 turbo-jet engines—\$1,478,204

FARGO MOTOR CORP., Washington, D. C.
Trucks—6 ea.—\$16,840

FIRESTONE TIRE AND RUBBER CO., World Bestos Div., New Castle, Ind.
Lining set brake shoe—32,500 ea.—\$88,725

FOOTE BROS. GEAR & MACHINE CORP., Chicago, Ill.
Maintenance parts for A/C—Various—\$62,759

FORD MOTOR COMPANY, Dearborn, Michigan
Research and development T160 (M39)
20mm automatic gun—\$150,000

FORD MOTOR CO., Ford Div., Washington, D. C.
Trucks—369—\$245,710
Automobiles—438—\$669,180
Trucks, tractor—12 ea.—\$31,058

THE FOUR WHEEL DRIVE AUTO CO., Clintonville, Wisconsin
Type MM-1, multi-purpose truck—\$6,195,475

GAR WOOD INDUSTRIES, INC., Wayne, Michigan
Automotive spare parts—299—\$135,872

GENERAL DYNAMICS CORP., Convair Div., San Diego, Calif.
F-106B aircraft—\$4,200,000
C-131E airplanes—\$1,500,000

GENERAL MOTORS CORP., AC Spark Plug Div., Flint, Mich.
Compuere, tracking, indicator, pilots data, power supply—\$1,156,322
Fire control system, T-38—Various—\$370,263
Spark plugs—Various—\$1,407,009

GENERAL MOTORS CORP., AC Spark Plug Div., Milwaukee, Wisconsin
Facilities in support of WS-315A program—\$2,084,934

GENERAL MOTORS CORP., Allison Div., Indianapolis, Ind.
T56-A-1A turbo-prop engines—\$17,257,390

Services and supplies necessary to modify and convert J33-A-33/33A engines to the following: J33-A-37 turbo-jet aircraft engines (TM 616 missile) and J33-A-41 turbo-jet aircraft engines (YTM 61B missile)—\$2,446,600

Special tools and equipment for J33 engines for F-80 aircraft—40 ea.—\$62,604
J71-A-2 engines for F3H A/C—\$7,573,500
Item No. 1 hub, steer clutch, with integral gear item No. 2 hub, steer clutch, with integral gear; item No. 3 stator, first and second, assy.—740—\$75,310

GENERAL MOTORS CORP., Chevrolet Motor Div., Detroit, Mich.
Trucks—255—\$431,349
Station wagons—8 ea.—\$13,967
Automobiles—77 ea.—\$104,829
Automobiles, sedan and station wagon—\$38,104

GENERAL MOTORS CORP., Foreign Dist. Div., New York, N. Y.
Trucks—27—\$49,106

GENERAL MOTORS CORP., GMC Truck & Coach Div., Pontiac, Mich.
Preservation, protection, and maintenance of Government property—\$257,792
Trucks—2 ea.—\$11,980
Automotive spare parts—32,450 ea.—\$130,108
Truck spare parts—3612 ea.—\$52,454

GENERAL MOTORS CORP., New Departure Div., Bristol, Conn.
Bearings—74,200 ea.—\$167,909
Bearings—ball, various sizes and specifications—10,070 ea.—\$32,400

GENERAL MOTORS CORP., United Motors Service Div., Detroit, Mich.
Automotive spare parts—Various—\$249,713

THE GENERAL TIRE & RUBBER CO., Akron, Ohio
Wheel assys., 12.50-16, for C-130A aircraft—\$38,420

THE B. F. GOODRICH CO., B. F. Goodrich Aviation Products Div., Akron, Ohio
Aircraft fuel cells applicable to F84F, RF84F and RF84K aircraft—24 items—\$984,851

B. F. GOODRICH TIRE CO., Div. B. F. Goodrich Co., Akron, Ohio
Maintenance parts and assys. for various A/C—Various—\$99,548

THE GOODYEAR TIRE AND RUBBER CO., INC., Akron, Ohio
Wheel assembly, 26x6; brake assembly (for 26x6 wheel); brake assembly (for 26x6.6 wheel) for T-33A aircraft—\$267,166
Aircraft fuel cells applicable to F84F aircraft—15 items—\$912,081
Wheel assys., 11.00-12; brake assys. for 11.00-12 wheel; wheel assys. 1.00-12, for H-34A aircraft—\$46,659

(Turn to page 154, please)

JOHNSON *tappets*



keep pace with today's engines

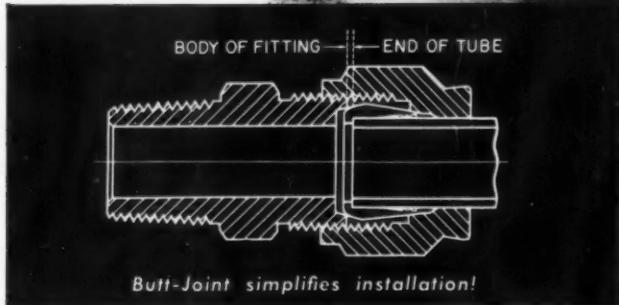
Continual experimentation and excellent manufacturing methods show a steady product improvement that make JOHNSON TAPPETS worthy of your consideration.

Only proven materials, covering a range of steel, chilled iron, and various iron alloys are used in the manufacture of JOHNSON TAPPETS, providing greater strength, light weight and increased wear resistance. Serving the AUTOMOTIVE — AIRCRAFT — FARM — INDUSTRIAL — MARINE Industries.

"Tappets are our business"

JOHNSON  **PRODUCTS**
INC.
MUSKEGON, MICHIGAN

*the most important advance
in tube fittings in 20 years!*



Butt-Joint simplifies installation!

New **IMPERIAL**
HI-SEAL
TM.

Furnished in steel and stainless steel

makes a positive butt-joint • no need to spring tubing • withstands higher pressures • foolproof assembly • no flaring or threading

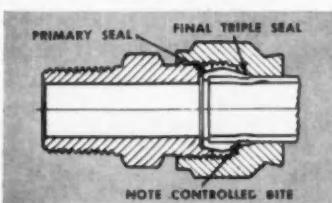
Hi-Seal is the successor to all present tube fittings for high-pressure, severe service. Never before such ease in making a truly foolproof tubing connection. Sleeve fits only one way, cannot be installed in reverse — no chance for error. Positive butt-joint with no tube entry into body of fitting eliminates need to spring tubing. This is especially important when working with large-diameter, heavy-wall

or hard-temper tubing. Positively no torquing of tube when making a joint!

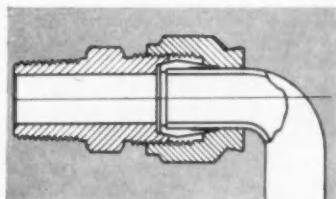
All this plus the fact that Hi-Seal fittings can be disconnected and reconnected as often as desired with assurance of original pressure-tight seal!

Conforms to
J.I.C.
Standards

Ask your Imperial distributor for
full details on the Hi-Seal Fitting.
Write for Bulletin 3061.



FOOLPROOF ASSEMBLY — Hi-Seal goes together only one way. No need to disassemble or double check for tightness.



CLOSER TUBE BENDS — works in close quarters where other types of fittings cannot be used. A real aid to design.



WITHSTANDS HIGHER PRESSURES — Joints stay tight beyond the burst pressure of the tube . . . thoroughly field tested.

Created and manufactured exclusively by . . .

THE IMPERIAL BRASS MANUFACTURING COMPANY
1241 W. HARRISON STREET, CHICAGO 7, ILLINOIS

IMPERIAL

In Canada: 334 Lauder Ave., Toronto, Ontario

Industry's most complete line of tube fittings and tubing tools.

(Continued from page 152)



"FAIRFIELD

for FINE GEARS"

WHAT FAIRFIELD Facilities CAN MEAN TO YOU

1. **MASS PRODUCTION ECONOMY**—Large or small, you get the benefits of high production rates and big volume output at Fairfield—where fine gears are produced to meet your specifications **EFFICIENTLY, ECONOMICALLY!**
2. **QUALITY PLUS**—There is no finer recommendation for the quality of the product you sell than to be able to say it is "EQUIPPED WITH FAIRFIELD GEARS!"
3. **DEPENDABLE SOURCE OF SUPPLY**—Fairfield is one of America's largest independent producers of precision-made, automotive type gears for leading builders of construction, agricultural, industrial, marine, and automotive equipment.
4. **BACKED BY EXPERIENCE**—Unexcelled facilities in an ultramodern plant backed by more than thirty-five years' experience in producing Spur, Herringbone, Spiral Bevel, Straight Bevel, Hypoid, Zerol, Worms and Worm Gears, Splined Shafts, and Differentials to customer's specifications.
5. **ENGINEERING SERVICE**—Fairfield engineers are qualified to make expert recommendations on your gear production requirements. *Your inquiry will receive prompt attention.*

FAIRFIELD
MANUFACTURING CO.



2303
S. Concord Rd.

for FINE
GEARS!

Lafayette,
Indiana

GOULD NATIONAL BATTERIES, INC.,
St. Paul, Minn.

Battery, type 4H, 6-volt—\$63,140

HARNISCHFEGER CORP., Seattle,
Washington

One 35-ton truck mounted mobile crane
—\$67,083

HOLLEY CARBURETOR CO., Van Dyke,
Michigan

Services and repair parts for fuel con-
trols—Various—\$240,573

Weight, piston assys.—Various—\$246,459

Thrust ball bearings—Various—\$74,696

HUGHES AIRCRAFT COMPANY, Culver
City, Calif.

Interceptor aircraft and weapon con-
trol system, Type MA-1—\$10,000,000

INTERNATIONAL HARVESTER CO.,
Washington, D. C.

Trucks—18 ea.—\$51,501

School bus—9 ea.—\$40,028

Buses—23 ea.—\$92,359

KYSOR HEATER CO., Cadillac, Mich-
igan

Kit, deep water fording—457 ea.—
\$121,851

LELAND ELECTRIC CO., Div. American
Machine and Foundry, Dayton, Ohio

Motor generators aircraft—\$357,853

LINK AVIATION, INC., Binghamton,
New York

F-106A flight simulator trainers, type
MB-42—\$2,100,000

LOCKHEED AIRCRAFT CORP., Bur-
bank, Calif.

T-33A aircraft—\$18,951,360

Mobile training units of the F-104A air-
craft—\$420,000

LOCKHEED AIRCRAFT CORP., Mari-
etta, Georgia

Additional funding action for modern-
ization of C-130A airplanes—\$865,000

Flight test program and engineering
changes on C-130A aircraft—\$149,554

Fabrication of B-47 modification kits—
Job—\$6,000,000

LOCKHEED AIRCRAFT SERVICE-
INTERNATIONAL, INC., Jamaica,
New York

IRAN and flight test of T-29 type air-
craft—71 ea.—\$1,260,074

THE MANSFIELD TIRE & RUBBER
CO., Mansfield, Ohio

Tire, truck and bus, 1400x20, 12 ply—
384 ea.—\$38,442

MARGO MOTOR CORP., Washington,
D. C.

School bus—4 ea.—\$17,135

MAR-PAK CORPORATION, Painesville,
Ohio

Reclamation of B-36 type aircraft—
\$758,899

GLENN L. MARTIN COMPANY, Denver
Colorado

Facilities in support of WS-107A pro-
gram—\$10,800,000

NORTH AMERICAN AVIATION, INC.,
Los Angeles, Calif.

Airplane retrofit kits for F-100C air-
craft—\$274,196

NORTH AMERICAN AVIATION, INC.,
Fresno, Calif.

Installation of advanced electronic
equipment and IRAN of 277 F-86D
aircraft—Job—\$4,966,332

O&S BEARING MANUFACTURING CO.,
Whitmore Lake, Mich.

Automotive spare parts—5794 ea.—\$38,-
546

OSHKOSH MOTOR TRUCK, INC., Osh-
kosh, Wis.

Truck with front snow plow—1 ea.—
\$16,700

(Turn to page 156, please)

6,000 horsepower in a single **CLARK CBA-8** **balanced/opposed** **compressor**

Now, for the really big applications, Clark introduces the most powerful compressor ever built—the new CBA-8. The ability to handle tremendous horsepower, however, is not the only feature of this new compressor. Being extra heavy and rugged in all respects, it is the perfect choice for those services where extremely high pressures are required such as in the process industries and for high pressure wind tunnel applications.

High discharge pressure invariably causes a high pressure rise across the cylinders which results in heavy pin loads. The new CBA-8 is designed to carry pin loads of 100,000 pounds with ease. For large air compressor installations, at normal pressures, the CBA-8 will operate with minimum maintenance because of its heavy construction. The balanced/opposed design principle, originated by Clark, assures vibrationless operation.

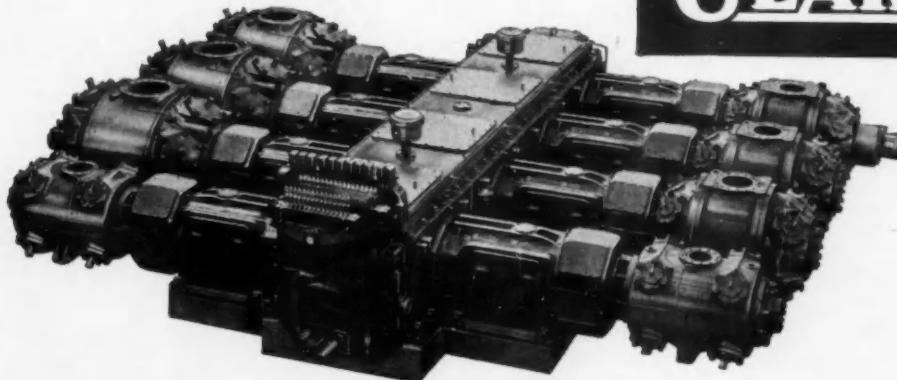
Two new CBA-8 units already have been delivered for a special application. Your Clark representative will gladly give you full details on this new unit.

CLARK BROS. CO. • OLEAN, N. Y.

One of the Dresser Industries

Sales offices in Principal Cities Throughout the World

Balanced/Opposed Compressors



CLARK



(Continued from page 154)

REO MOTORS, INC., Washington, D. C.

Trucks—10—\$56,526

REO MOTORS, INC., Lansing, Michigan

Automotive spare parts—39,170 ea—\$44,654

ROCKWELL SPRING & AXLE CO., Timken-Detroit Axle Div., Detroit, Michigan

Automotive spare parts—350 ea—\$145,278

ROSS GEAR AND TOOL CO., Lafayette, Ind.

Item No. 1 gear, steering W/O wheel and pitman arm assembly, item No. 2 same as Item 1 above—2175—\$38,054

RYAN AERONAUTICAL COMPANY, San

Diego, Calif.

Q-2A drones and spare parts—\$2,374,554

SIKORSKY AIRCRAFT, United Aircraft Corp., Stratford, Conn.

H-19D Air Force helicopters—\$792,000

Repair and/or overhaul of H-5, H-18 and H-34 rotor blades—818 ea—\$343,930

SILENT HOIST AND CRANE CO., INC., Brooklyn, New York

Truck, fork lift, gas, 15,000 lb cap—64 ea

—\$472,320

SYMINGTON OF SEATTLE, Seattle, Washington

Truck—3 ea—\$12,819

THOMPSON PRODUCTS, INC., Cleveland, Ohio

Bearings, gears—various—\$201,053

TINNERMAN PRODUCTS, INC., Cleveland, Ohio

Nut—232,000 ea—\$31,223

TITEFLEX, INC., Springfield, Mass.

Starter parts, aircraft engine—2 items—\$54,433

TRIPLEX CORP. OF AMERICA, Pueblo, Colorado

Piston with pin assy (020 O.S.) and piston with pin assy (040 O.S.)—49,976

—\$75,863

UNITED AIRCRAFT CORP., Hamilton Standard Div., Windsor Locks, Conn.

Air turbine starter, BuAer model A-16—\$137,793

Propeller equipment—\$26,141,040

Services and material for dural blades, propeller barrels—Various—\$260,369

Services and materials for propeller barrels—720 ea—\$272,563

UNITED STATES RUBBER CO., Passaic, New Jersey

Rubber aircraft hoses—Various—\$262,709

UTICA-BEND CORP., Utica, Michigan

Facilities for production of truck, 2½ ton, 6x6, M35/M133 series—\$750,000

VERTOL AIRCRAFT CORP., Morton, Pa.

Repair and/or overhaul of H-21 transmission and rotor hub assemblies—943 ea—\$277,672

VICKERS, INC., Detroit, Michigan

Automotive spare parts—506 ea—\$49,960

WATSON AUTOMOTIVE EQUIPMENT CO., Washington, D. C.

Ambulances—11 ea—\$56,507

THE WEATHERHEAD CO., Cleveland, Ohio

Nut-tube coupling—44,000 ea—\$67,760

WILLYS MOTORS, INC., Toledo, Ohio

Trucks—144—\$326,451

Engine, gear driven, with accessories, for truck, ¾-ton, 4x4—\$143,855

Trucks, station wagon body—68 ea—\$144,253

BOOKS ...

BODY ENGINEERING, by Sydney F. Page, published by Chapman & Hall Ltd., 37 Essex St. W. C. 2, London, England.

Price, 25s. This book is chiefly concerned with British design and construction methods used in vehicle bodywork. A second edition, this work contains the latest information on such recent developments as the application of rubber fenders and reinforced plastics. The main body of the book is devoted to such topics as materials, designing and drafting, sheet-metal projection, caravans and trailers, bodywork interiors, and practical bodywork construction. Although some of the terminology used may bewilder some American readers, this book should be useful to anyone who wants to compare British and American styling methods.

ASTM STANDARDS ON ZINC-COATED IRON AND STEEL PRODUCTS, published by American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa. Price, \$2.25. This volume includes 21 specifications, four of them are new or recently revised; three recommended practices, two of them new; and five methods of tests. Among the materials covered are wire, strands, fencing, sheets, hardware, terne-alloy-coated sheets, and miscellaneous products.**GOSHEN**

TETRASEALS

*a unique development in high-performance, economical seals for static applications by**Goshen Rubber*

RECTANGULAR-SECTION RINGS



If low friction plus dependable sealing at a wide ambient temperature range are your requirements, then TETRASEALS are for you . . . for static and in some cases, moving applications. TETRASEALS are interchangeable with standard O-Rings, use the same groove, and are non-laminated (in one homogeneous piece).

Edges are accurately formed, and cross-sectional tolerances can be held to $\pm .004$ depending on inside and outside diameter, on size of cross-section and on material desired. Available in natural, synthetic, and silicone rubber compounds to meet MIL, AMS, SAE, ASTM and industrial specifications. To find out what TETRASEALS can do for you, ask for Technical Bulletin No. 11.

See our catalog in Sweet's Product Design File.

PUT *Goshen Rubber* TO WORK FOR YOU

GOSHEN RUBBER CO., INC., 2717 S. TENTH ST., GOSHEN, IND.

Big Advantages!

in this



This 113' pre-enameling machine was dry cycling four days after delivery. Capacity 100 100-lb. racks per hour. Overall height of lift only 13'.

WAGNER PRECISION AUTOMATIC

INCREASED LOAD CAPACITY

PRACTICAL FLEXIBILITY

LOWER PRODUCTION COSTS

REDUCED MAINTENANCE

100% USER ADJUSTABILITY

SIMPLIFIED INSTALLATION

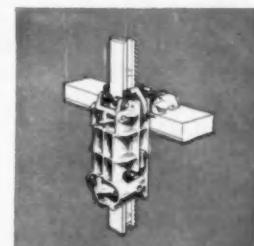
IMPROVED PLATING QUALITY

This modular precision electroplating machine is a big subject. Please send for our technical bulletin, learn all the facts, compare—or call the Wagner Man in your area. He'll study your problems and help you achieve better plating at lower costs.

Any day of the week you'll see us lift a 3200 pound automobile with the elevating mechanism of our standard automatic plating machine. That's just to dramatize the dynamic lift capacity of our modular type machine. This excessive capacity simply means that deflection under normal loads is minimum, thus strain on alignment mechanisms is eliminated, wear and downtime is reduced to the vanishing point. Your own personnel—any mechanic—can make precision adjustments of critical transfer members, including the main lift boom, carrier lift angle assemblies and carrier rail support brackets. Maintenance is simple as standard gear racks and pinions are used throughout the entire elevator mechanism (alho capacity can be increased 50% by substituting our heavy duty rack). Hardened guide rollers have positive lubrication—or central lubrication may be installed at low cost.

Here's how you get low cost installation and servicing, even later alterations. All details are interchangeable, precision drilled and machined, preassembled. Our modular design permits easy lengthening or shortening for long term production changes; parts, assemblies, even sections may be replaced. Every part is drilled, reamed, tapped and milled in special co-ordinated fixtures; sections are assembled in giant jigs for fool-proof self-aligning. A single hydraulic power unit interconnected to two hydromotors with micro adjustment of acceleration and deceleration permits work carriers to be lifted, transferred and deposited gently without jarring or loss of parts.

Typical pre-assembled single station elevator housing ready for bolting through jig-drilled holes in main carriage. Note adjustable roller guide brackets.



400 MIDLAND AVE., DETROIT 3, MICHIGAN
CHICAGO • CINCINNATI • CLEVELAND • INDIANAPOLIS • NEW YORK • ROCHESTER • GRAND RAPIDS

Wagner
BROTHERS INC.



Where else can
DUREZ PHENOLICS
do the job best?

For more than 20 years the water pump impeller of molded phenolic plastic has proved so dependable that most car owners never hear of it. Dimensionally stable, impervious to anti-freeze and anti-rust solutions, it performs like new for the life of the vehicle.

In your continuing search for new and better materials, lower unit cost, faster assembly, and longer wear, have you investigated the properties that

make Durez phenolics outstanding for many automotive components? Electrically non-conductive and chemically inert, they withstand heat and impact in high degree, mold readily to any shape, and need little or no finishing.

New thermosetting plastics developed by Durez with glass fiber and other reinforcing fillers offer these properties in remarkable combinations. Check with your custom molder or call on our field service for help.

**OUTSTANDING PROPERTIES OF
PHENOLICS INCLUDE:**

- Dimensional stability
- Non-conductivity
- Resistance to heat and cold
- Impact strength
- Resistance to moisture
- Chemical resistance
- Moldability in intricate shapes
- Moderate cost



Phenolic Plastics that Fit the Job

DUREZ PLASTICS DIVISION

HOOKER ELECTROCHEMICAL COMPANY

2001 Walck Road, North Tonawanda, N. Y.



**ON OUR
WASHINGTON WIRE**

Markets for farm machinery, equipment, and supplies should be good in 1957. A gain of at least five per cent is expected by Agriculture Dept.

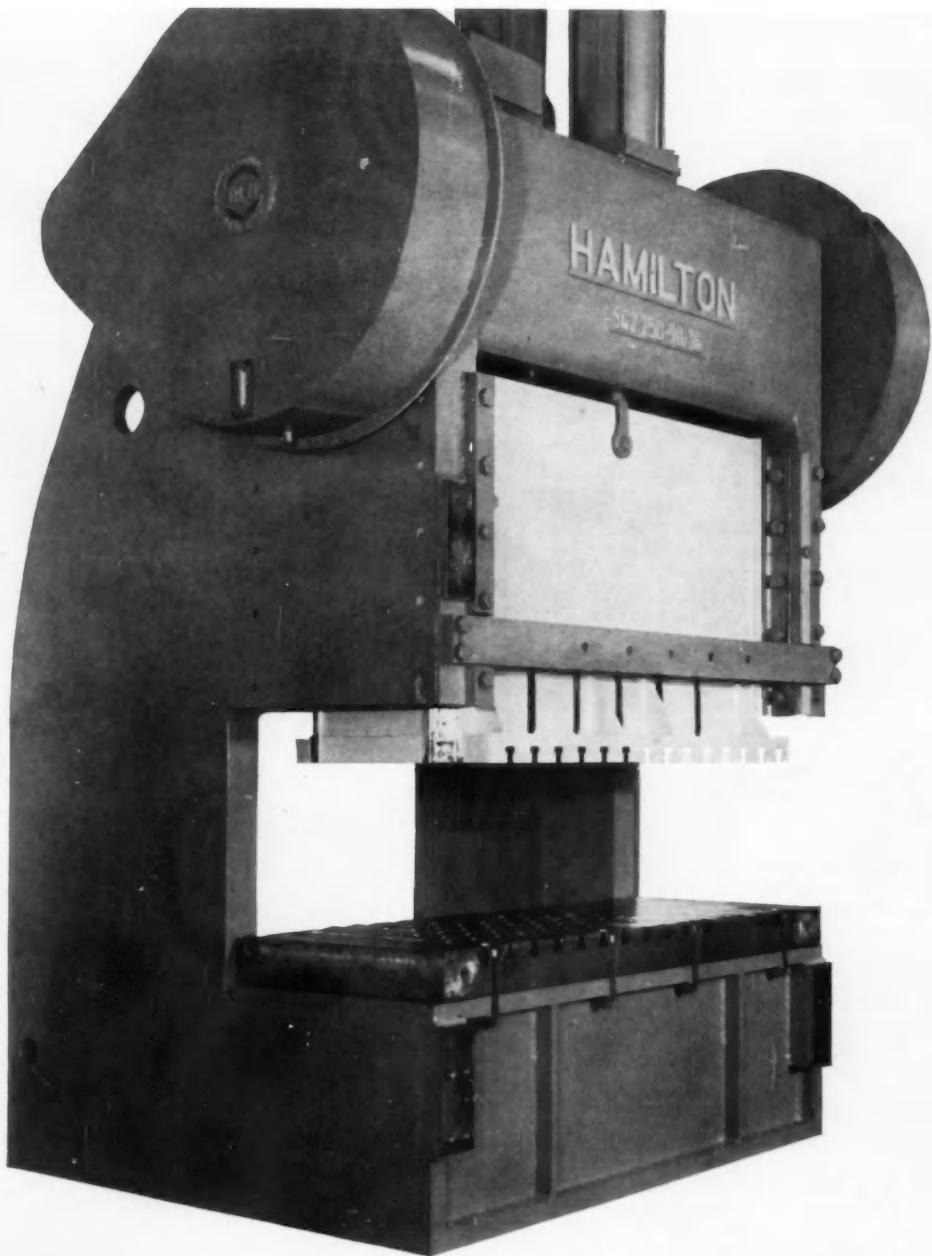
Administration's decision not to reopen any of the steel expansion goals kills more than \$2.3 billion in applications for fast tax amortization. Decision was based on word from Defense Dept. that its requirements for most materials in the future will be down.

Commerce Dept. has disclosed that the gross national product climbed five per cent in 1956 to a record \$412 billion. It was pointed out, however, that only half the rise represented larger output, while the other half reflected higher prices.

Tax-wise, 1957 is going to be a year of hot and heavy action in Washington. Small firms are due for some favorable "breaks" in the tax rates applying to them, and talk of a national sales tax will boil up in the halls of Congress again.

Defense-item suppliers who make items that require six months or longer to produce will now be able to draw more money early in the contract period, according to a new Pentagon policy. Moreover, as the supplier delivers parts of the item called for, a lower amount will be deducted for liquidation of progress payments. In effect, the supplier is being paid earlier, and the government takes longer to get its money out.

Helicopters that will handle more jobs than those now in service are sought by the Army. Design competition is to start next year on a light observation type that should cost about one-third as much as present models.



Hamilton press line expanded to include medium size presses

Pictured above is a new Hamilton Gap Press recently installed at the Eaton Manufacturing Company, Cleveland, Ohio. This new large-bed press stamps out the larger grille guards which the latest model cars are calling for.

The capacity of this press is 250 tons and the speed 28 to 30 strokes per minute. Bed area is 90 in. right to left; 36 in. front to back. It is one of a new line of single and double-crank presses ranging from 100-300 tons capacity.

Write to Hamilton Division, B-L-H Corporation, for full information and specifications on this new line of heavy duty Hamilton presses.

Hamilton Division Hamilton, Ohio
BALDWIN · LIMA · HAMILTON

Diesel engines • Mechanical presses • Can making machinery • Machine tools



STAINLESS
STEEL
MAKES THE
DIFFERENCE

...its effect on
modern styling

Clean lines. A crisp, new look. More functional. Lasting beauty. These are some of the effects modern designers gain with stainless steel—why they use more and more stainless steel every year in cars as well as appliances, housewares, furniture and houses.

To marketers, stainless steel combines the smart selling values of beauty and easy maintenance with the hard selling values of superior corrosion resistance, durability and toughness.

Stainless steel is available in countless work-saving standard shapes. It's readily machined, formed, joined, or cast.

For more facts about stainless steel and the contribution it can make to your product or marketing problems, see your stainless steel supplier or write ELECTROMET—leading producer of more than 100 alloys for the metal industries, including chromium and manganese used for making stainless steels.

**ELECTRO METALLURGICAL
COMPANY**

A Division of

Union Carbide and Carbon Corporation

30 E. 42nd Street **UCC** New York 17, N.Y.

**METALS DO MORE ALL THE TIME
...THANKS TO ALLOYS**

Electromet
Trade mark



Stainless steel styling... first to catch the eye and quickest to capture the heart of the consumer. It combines beauty with hardness and strength to resist denting and scratching—and rust is never a problem.



Automotive Forecast for 1957

(Continued from page 55)

and Chrysler have not yet announced other major contract concessions but they are due to come within the next 30 to 60 days. American Motors in December announced a greatly improved dealer franchise embodying many of the GM provisions but did not go quite as far in some respects.

Last year also witnessed the continuing climb in popularity of station wagons and the so-called hardtop models. Station wagons accounted for 11 per cent of total production and undoubtedly will go higher in 1957. About 60 per cent of all station wagons sold last year were four-door models. Hardtops (sedans with no "B" posts) rose four per cent in popularity over 1955, accounting for 31 per cent of total production. Hardtops are pressing the long-time leader—the four-door sedan, which has dropped to 34 per cent—and undoubtedly will take over the top position this year.

Another interesting development of 1956 was the substantial gains made by the Volkswagen in the face of lower sales by most American makes under the previous year. All automobile companies have been watching V.W.'s progress carefully and the Big Three have again reviewed the small car possibilities, but still feel that the market potential does not warrant tooling for the production volume required for economic operations.

A year ago prospects for the two remaining independents, Studebaker-Packard and American Motors, were rather bleak but both of these companies survived the year and are going into 1957 with improved possibilities. During the year Studebaker-Packard entered into a management contract with Curtiss-Wright and has consolidated all automobile manufacturing in South Bend.

The new management has consolidated both Studebaker and Packard organizations into one and pared costs to the bone. While it sustained heavy losses for the year, it was expected to be in the black by the end of December, auguring a profitable operation this year.

American Motors also has put most of its heavy consolidation expenses behind it, and confidently expects to sell the 25,000 additional cars this year that will put it in the black. AM is concentrating on the Rambler and also putting more emphasis on the Metropolitan to take advantage of its exclusive position among American manufacturers in the compact and small car fields. It likewise suffered

substantial losses during 1956, but enters the new year with much more hopeful prospects for black ink results.

The outlook for 1957 is more clouded this year than it has been for some time past. Automobile company presidents are practically unanimous in forecasting the production of about 6.5 to 7 million cars this year. There are, however, many un-

dercurrents of doubt and when the pros and cons are balanced off it is difficult to come up with any confident conclusion.

Basically, the optimistic forecasts of the 10 per cent increase in 1957 are based on a continuing higher level of national prosperity buttressed by world peace. Recent sobering events in the Middle East, however, have shaken the assurance of some industry officials, who think that further trouble in that area or Russian satellite countries might involve the U. S. in police action of some sort. On the

(Turn to page 164, please)

Have you a FASTENING PROBLEM?



Regular Type PALNUTS
Used alone on light assemblies; used on top of ordinary nut on heavy assemblies.



Washer Type PALNUTS
One-piece lock nut and flat washer, replaces ordinary nut, lockwasher and flat washer.



Acorn Type
Self-locking nut covers, rough bolt ends, adds pleasing appearance. Also available with open top.



Sealer Washer Type
Has plastisol compound to seal out water and dirt. Replaces 4 parts.



Spacer Washer Type
Spans bosses and protruding elements. One part eliminates three.

Type "H" PUSHNUTS
Speedily applied, hold tight even on hard chrome studs of emblems, nameplates, ornaments, etc.

Grounding Washer Type
Cuts through coatings to achieve electrically grounded assembly.

Electrical Washer Type
For instruments, ammeters, gauges, electrical studs, air inlet and dash controls.

Wing Type
Used on battery hold downs and air cleaners; can't loosen in service. Easily finger tightened or removed.

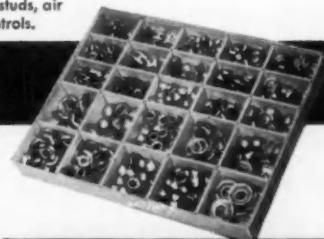
Write on company letterhead for
FREE SAMPLE KIT

Give your name, title and department and specify whether you are working on body or electrical work, to receive the proper sample assortment. Address letter to Detroit office shown below.

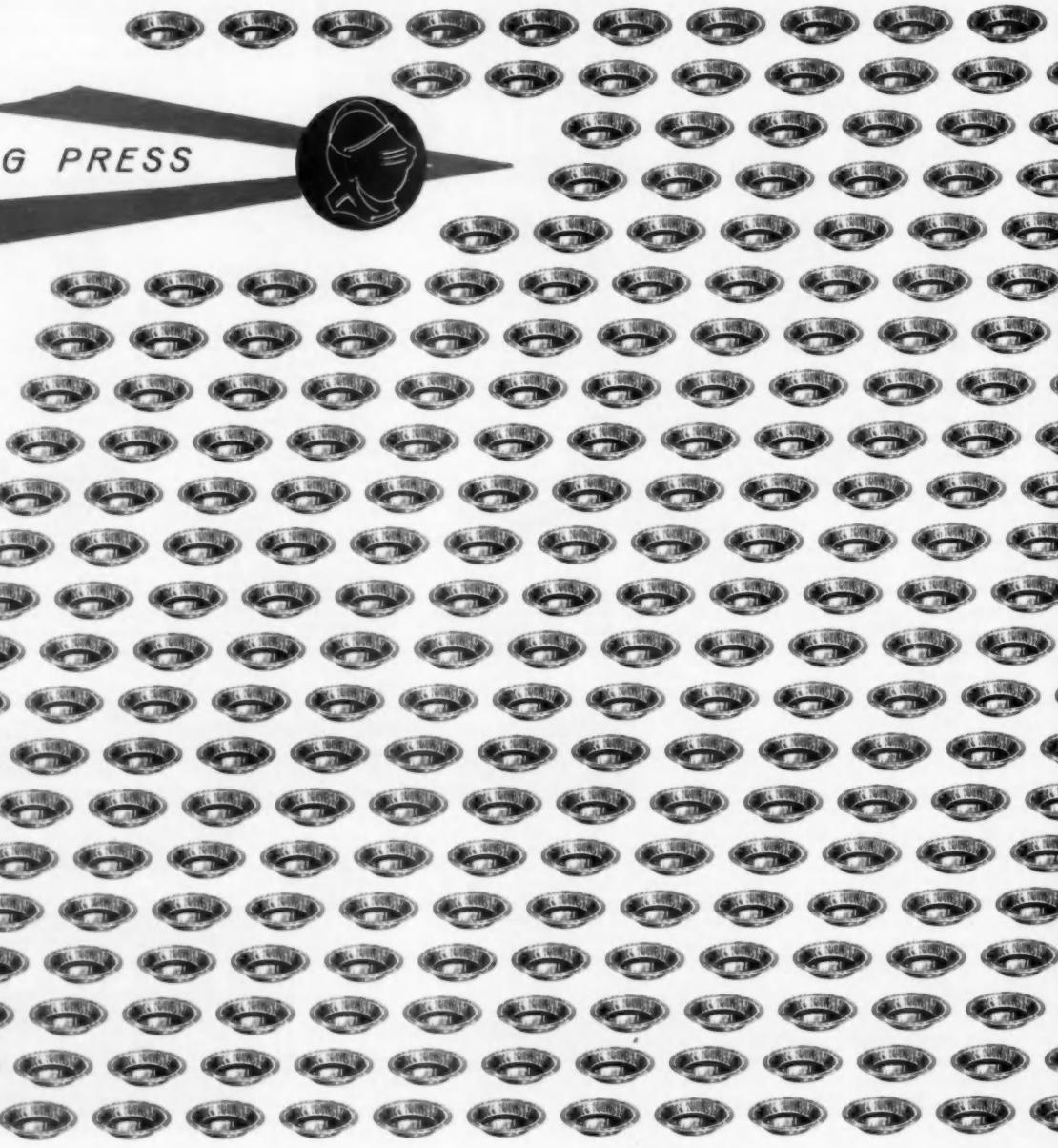
THE PALNUT COMPANY

Regional sales office and warehouse

730 West Eight Mile Road,
Detroit 20, Mich.



PALNUT
TRADE MARK
LOCK NUTS



FLYING PRESS





Just **1** Minute!

**You are looking at 60 seconds worth
of Wean Flying Press production**

Over 400 aluminum pie plates, of .002 gage strip, in just one minute! During a demonstration run of the "Flying Press" in the Wean Testing Laboratory, another "conventional press" record fell by the wayside — this time the products were four-inch diameter pie plates, of hard-to-handle .002 gage aluminum strip. The Wean "Flying Press," fitted with the same dies used on the old-type press, nearly quadrupled the normal production limit of 110 per minute.

This bit of magic wasn't done by mirrors — it was the result of an entirely new type of industrial press. The revolutionary Wean "Flying Press" features a continuous-feed design that allows for much greater speed and increased accuracy. It eliminates the clutch and brake which are integral parts of the old intermittent feed presses, and hence reduces press maintenance costs which center largely in these areas.

If you are performing a blanking, piercing, notching or shallow draw operation on either light or heavy gage strip, you can't afford to ignore this revolutionary new press. The first step to adding the Midas touch to your balance sheet is to make an appointment for a demonstration of the Wean "Flying Press." Write today — Wean Equipment Corporation, 22800 Lakeland Boulevard, Cleveland 17, Ohio.

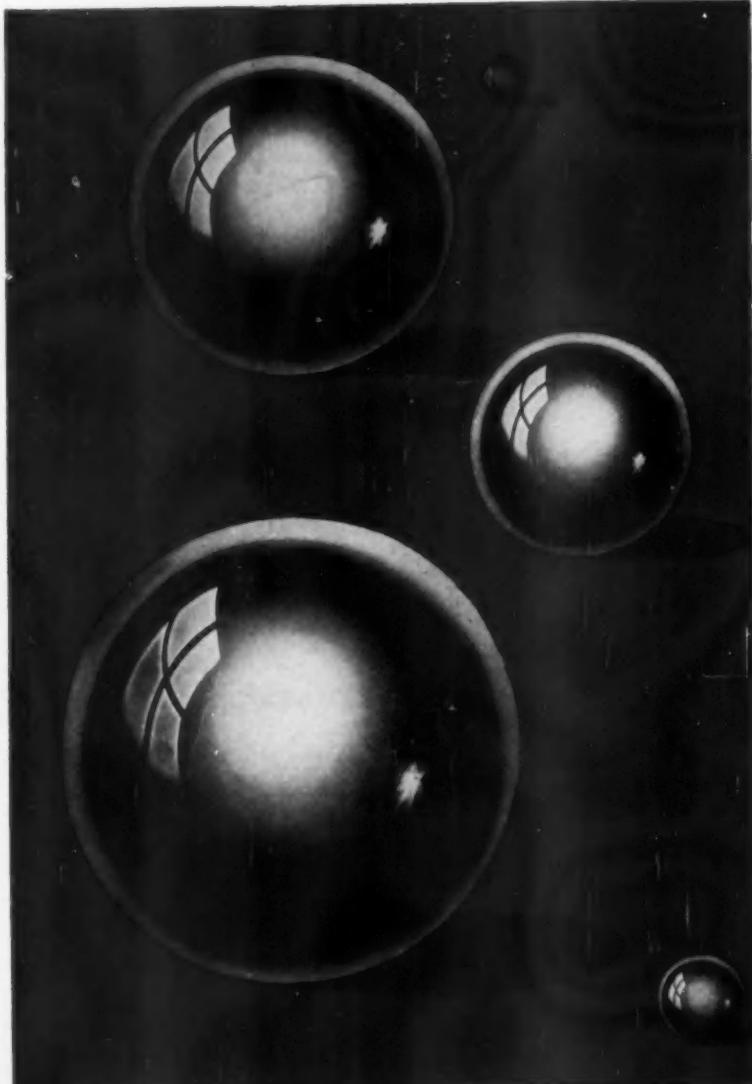
On this page are pictured over 400 aluminum pie plates. Those printed in red indicate one minute's production made on conventional equipment. Those in black are the "bonus" the Wean "Flying Press" can provide. A production increase of nearly 300%.

9985

Wean

EQUIPMENT CORPORATION

CLEVELAND • CHICAGO • DETROIT • NEWARK, N. J.



COOLIDGE *Balls*

CHROME ALLOY AND STAINLESS

COOLIDGE CORPORATION
MIDDLETOWN, OHIO

Automotive Forecasts for 1957

(Continued from page 161)

other hand, the threat of conflict may well stimulate defensive buying by part of the public and actually increase the sales potential of new cars. At the same time, there is no doubt that the Suez fracas which cut off oil supplies for Europe has seriously affected the export business of American automobile companies.

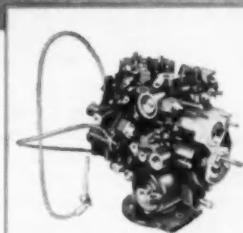
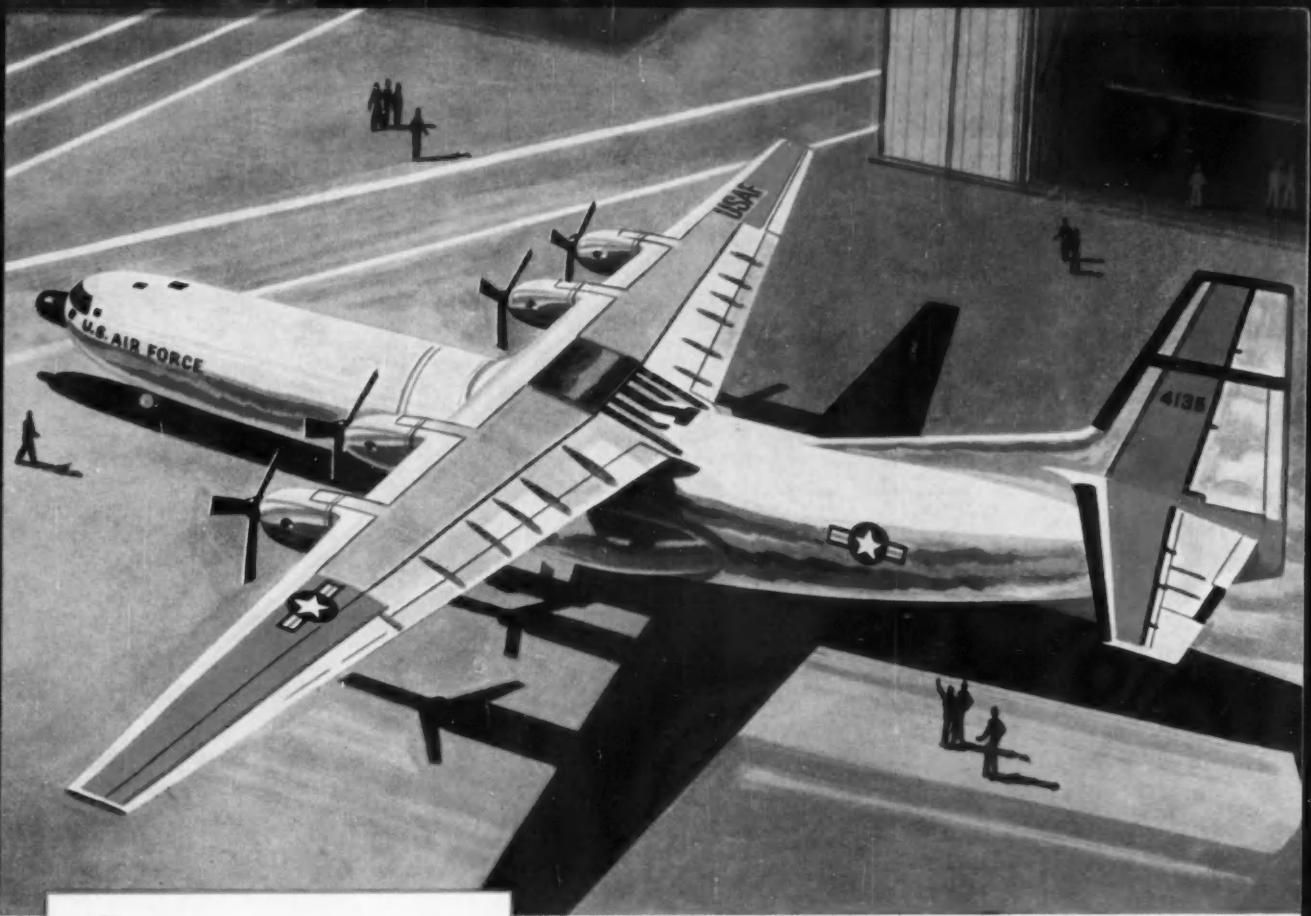
Another concern is the matter of adequate credit to finance the sales of new cars this year. A recent survey by AI, however, indicates that the finance community is confident that adequate funds will be available to support a normal two-thirds ratio of installment buying on the expected 6.6 million new car sales this year. Money will be tight and cost more but will be available to finance at least that many deals on a sound basis if the customers want to buy the automobiles, according to finance sources. Also, there is some belief that the money supply may improve by late summer.

Still another reservation raised by some more cautious observers is competition from other goods for available expendable consumer income. They are wondering whether the public's appetite for new cars, which was phenomenal for many years after the war, may have become sated and that prestige and social importance of driving a new automobile every year or two may have diminished.

Countering that line of thought, the industry believes that sales of the new models, with their crisp fresh styling have already given an indication that the buying public is willing to pay the higher prices for the latest in automobile transportation. They expect a sizable proportion of the 18.5 million buyers of new cars over the past three years to be back in the market again in 1957.

Furthermore, at least two-thirds of those who bought new cars in 1955 will have no credit problem since they either paid cash for their cars originally or have already paid, or will pay off shortly, their installment obligations. Consequently they will have a substantial trading equity to apply on a new car purchase.

Replacement of scrapped cars also has risen steadily during recent years and is expected to increase from year to year. The 1956 scrappage is estimated at nearly 4 million cars, providing a healthy basic replacement market. (Turn to page 166, please)



Typical of engine control systems designed and manufactured by Holley is this R-85 unit developed for the Pratt & Whitney Aircraft T34 engine which powers the huge Douglas C-133A, above.



More than half of America's truck manufacturers use Holley integrally-designed engine control systems to provide their products with maximum power at minimum operating cost.

More than ten million automobiles on the road today are equipped with carburetors, distributors and heat regulators designed by Holley to give finest engine performance.



Giant new cargo carrier uses Holley engine control system

Imagine the power required to lift this plane and cargo of 137½ tons into the air. Largest transport ever produced, the huge Douglas C-133A is equipped with four Pratt & Whitney T34 turboprop engines together with Holley R-85 fuel controls.

In cooperation with engine manufacturers, Holley engineers design, develop and manufacture many aircraft engine controls vital to the air defense of the U.S. Among them: components for the J-57 engine which powers many of the new "century" series interceptors.

Additionally, Holley has built carburetors, distributors and heat regulators for more than ten million automobiles on the road today. And more than half of America's major truck manufacturers factory-equip their products with Holley engine control systems.

Wherever engine control systems are needed, Holley's half century of design, engineering and manufacturing experience can best meet your requirements.

For more than half-a-century — original equipment manufacturers for the automotive and aviation industries.

HOLLEY
Carburetor Co.

Automotive Forecasts for 1957

(Continued from page 164)

Principal supporting argument for the 6.5-7 million car year is the flourishing national economy which gives every indication of continued expansion this year. Both Ford and Chrysler believe car production in 1957 may be the second best in history. Employment is at an all-time high, personal incomes are at record levels

and personal savings have been accruing at a higher rate than at any time since World War II. Federal spending for defense probably will increase this year and expenditures for roads and schools certainly will be substantially higher, both of which will underpin an already vigorous economic index.

Whether the substantially higher prices of new cars this year will prove a stumbling block to sales should be known very soon, now that the initial early buying rush for new models has passed. In fact, there were scattered reports that some resis-

tance was encountered in December but whether it was because of higher prices or just a normal pre-holiday letdown is not yet clear.

Suppliers of components to the automobile industry also will have a better year in 1957 if vehicle production approximates the 10 per cent increase generally forecast. Vendors naturally did not do as well in 1956 as in the previous record year, but should show a substantial increase in net in 1957.

While the outlay for capital expenditures by the automotive industries this year is not expected to equal the 1956 level, it still will be a substantial one, in the area of \$1.3 billion for car makers alone. Suppliers also will continue to buy more efficient equipment. More significantly for equipment manufacturers, a larger percentage of the total capital expenditures this year is expected to be for modern cost-saving equipment being developed by the machine tool industry.

The Big Three again this year will account for the bulk of automotive industry expenditures for plant and equipment expansion and modernization. General Motors will spend \$700 million for capital improvements, primarily for advanced types of production equipment.

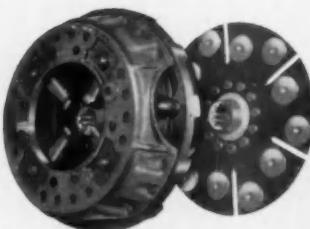
Ford has earmarked about \$439 million for 1957 capital expenditures. Projects under construction and to be finished this year include six engineering buildings, an engineering plant, an automatic transmission plant, glass plant, Ford, Mercury, and Lincoln Division assembly plants, parts manufacturing, aluminum castings, steering gear and cold-heading plants, and a new parts depot. While Ford does not specifically indicate any percentage of the total for new machine tools and other production equipment, it undoubtedly will account for a substantial percentage.

Chrysler plans to spend about \$130 million in plant expansion and improvement and for new equipment this year. The company has a new stamping plant nearly ready to go into production and is converting its Newark, Del., tank plant to automobile assembly. As Chrysler's fortunes rise, as they appear destined to do this year, the company undoubtedly will undertake more modernization and expansion.

ROCKFORD

MORE

CLUTCH LIFE
TORQUE CAPACITY
HEAT RESISTANCE



Designed especially for use in heavy-duty, high-speed engine equipped machines such as trucks, tractors, earth movers, graders, shovels, cranes, dozers and oil field units—

New MORLIFE® CLUTCHES and CLUTCH PLATES Give—

MORE Clutch Life (400% MORE)

MORE Torque Capacity (100% MORE)

MORE Heat Resistance (50% MORE)



See this NEW type MORLIFE clutch at the Road Show in Chicago—or get full information how this clutch improves the operation of heavy-duty, off-highway machines, by writing Department E—

ROCKFORD Clutch Division BORG-WARNER
315 Catherine Street, Rockford, Illinois, U.S.A.

Export Sales Borg-Warner International — 36 So. Wabash, Chicago 3, Ill.

CLUTCHES



"MORLIFE clutch has gone 851 hours without slipping or adjustment."



"MORLIFE clutch going strong after 1695 hours, working in sand."



"MORLIFE clutches last 950 hours longer, without adjustment."



"MORLIFE clutch needs adjustment once a month, instead of daily."



"MORLIFE requires lighter handle pull and one tenth the adjustment."



"MORLIFE pulls harder and lasts six to ten times longer."



"Won't buy a unit that isn't equipped with Durable MORLIFE clutch."

Readers of

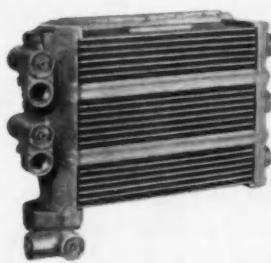
AUTOMOTIVE INDUSTRIES

are always well informed



HIGH OR LOW...

TEMPERATURE'S ALWAYS LEVEL!



Harrison oil coolers level heat for all kinds of aircraft—from small private planes to intercontinental bombers.

TEMPERATURES
MADE
TO
ORDER



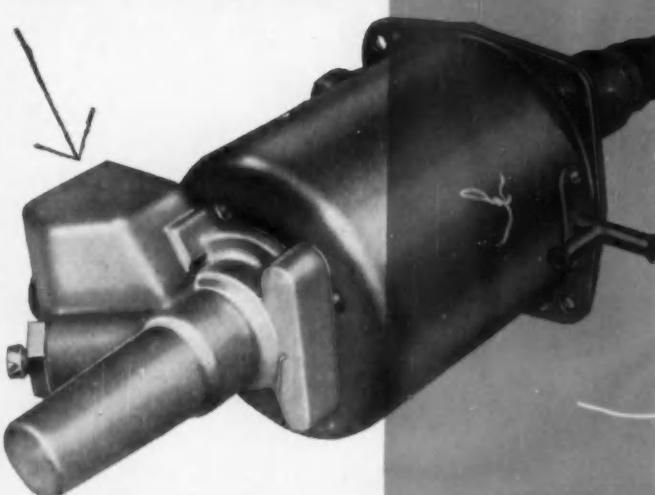
Watch "WIDE, WIDE WORLD" Sundays on NBC-TV

HARRISON

RADIATOR DIVISION, GENERAL MOTORS CORP., LOCKPORT, N.Y.

Zincilate

when ordinary protective coatings won't do!



Zincilate #611 meets all requirements of Spec. MIL-P-26915 (USAF)

In producing power boosters for master brake cylinders, ordinary protective coatings just won't do. If the coating is applied before the part is machined and fabricated, it breaks down during processing and there's no more protection. If it's applied after processing, then there's the tedious, costly job of masking off the uncoated areas on each piece. Another problem—every power booster must be immersed in diacetone to check for leakage—and the ordinary coating simply disappears upon contact with diacetone.

These are the kind of problems that require an outstanding protective coating—Zincilate. A quick whisk of a spray gun and each power booster is now coated—before machining and fabricating—with Zincilate #611 (one of several Zincilate formulations). There's no time wasted in masking off, and no amount of processing, even including clamping in a vise, will break down Zincilate's lasting, thorough protection. And about that testing for leakage—not even diacetone can pry Zincilate #611 loose!

When results, not mere first cost alone, are paramount, designers and producers of the finest metal products turn to Zincilate for the solution to protective coating problems. If you'd like more information on Zincilate, just outline your problem, on your company letterhead please, and we'll tell you frankly just what Zincilate can do for you.

Zincilate

CORROSION-RESISTANT,
ABRASION-RESISTANT,
WELDABLE, AIR-DRIED and
BAKED PROTECTIVE COATINGS

INDUSTRIAL METAL PROTECTIVES, INC., 403 HOMESTEAD AVE., DAYTON 8, OHIO

AIRBRIEFS

(Continued from page 96)

in the Aircraft Nuclear Propulsion program. Studies in this field contemplate the development of nuclear propulsion systems for aircraft and missiles.

Marquardt has pioneered in the development of ramjet engines and is currently in production on supersonic type for missile application. The company has also done extensive work in the turbojet field including development of afterburners, variable exit and reverse thrust nozzles, engine controls and variable inlet controls.

Hiller Gets Order For Flying Platforms

A half-million dollar contract has been awarded by the Department of the Army to Hiller Helicopters of Palo Alto, Calif., for two prototype, three-engined flying platforms. The contract will be administered for the Army by the Navy's Bureau of Aeronautics. Similar to the flying platform unveiled by Hiller in 1955, the one-man carrying machine will be powered by three 44 hp two-stroke, reciprocating engines. Thus a safety feature is incorporated, as two of the engines have sufficient power available for landing in case one of the three engines should fail in flight.

This type of flying machine employs a shrouded propeller design (ducted fan) to provide direct lift. The operator stands above the engine propeller drive and controls the machine by leaning in the direction he wants to go. Altitude of flight is controlled by a lever connected to the engines' throttles.

Prospective \$90 Million Worth of Airport Housing

According to the AOPA (Aircraft Owners and Pilots Association) the shortage of hangars throughout the nation is retarding the use of private and business aircraft. AOPA worked closely with the Civil Aeronautics Administration to determine that a potential market for \$90 million worth of airport housing now exists. Federal loans will be made available by the Small Business Administration to flight schools and air service operators to help them meet the demand for more adequate airplane housing. This should be an incentive to increase the number of general aviation airplanes in use.

(Turn to page 172, please)



why stainless puts a gleam in a buyer's eye

Folks know that only stainless keeps its new look and bright beauty for a lifetime. They know it needs almost no care . . . how it cannot pit, chip or peel . . . how it fights rust and corrosion. They know because they choose stainless for everything from table service to garden tools.

It's why stainless naturally puts a gleam in a buyer's eye when it's used from front bumper

to tail light on the car you'd like to sell him.

And stainless is tops, too, from your point of view. It's easy to fabricate . . . comes in a wide variety of grades and finishes . . . and requires no protective coating. Your Crucible representative can give you further details. See him soon. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

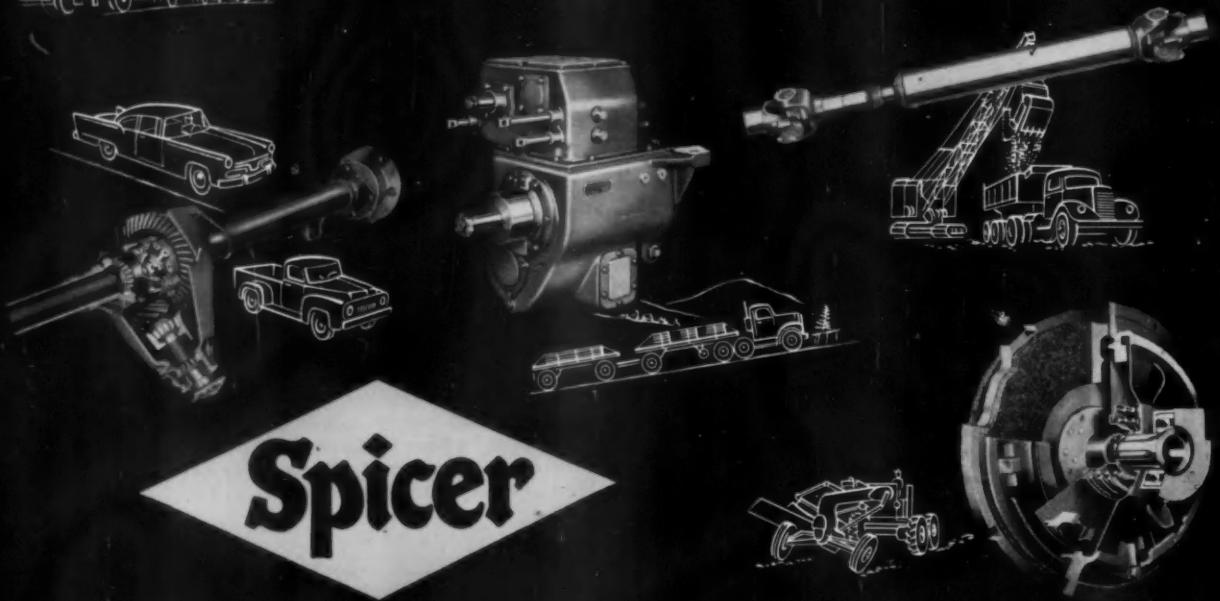
CRUCIBLE

first name in special purpose steels

Crucible Steel Company of America

Canadian Distributor — Railway & Power Engineering Corp., Ltd.

You plan well



Spicer

DANA CORPORATION

when you plan with DANA

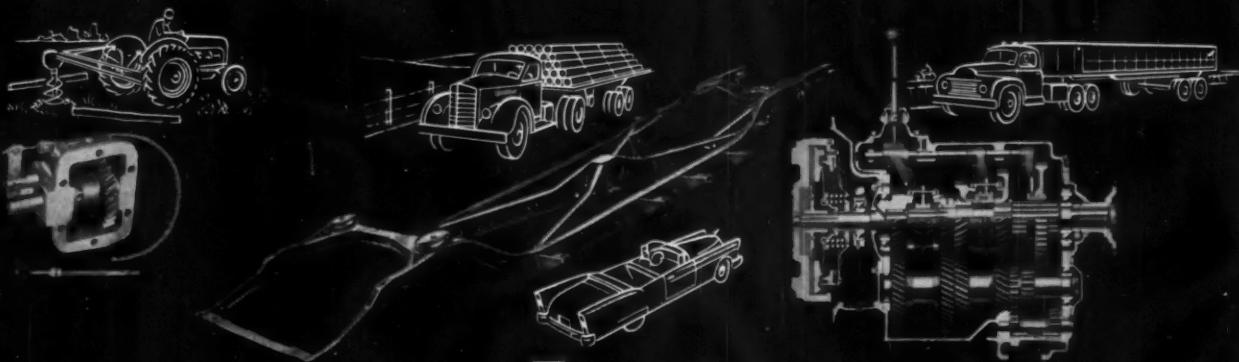
Consistently . . . year after year for over a half-century . . . Dana has built up a rich fund of knowledge and skill in automotive power transmission and chassis design.

Dana service is complete and comprehensive. It creates . . . engineers . . . manufactures. It is a service that has produced

millions of Spicer units for a majority of the manufacturers of automobiles, trucks, buses and tractors.

No matter what type of automotive vehicle you make . . . no matter what type of power transmission or chassis design you require . . . Dana engineers and resources can serve you well.

DANA will be at the ROAD SHOW



Toledo 1, Ohio

SPICER PRODUCTS: Transmissions • Universal Joints • Propeller Shafts • Axles • Torque Converters • Gear Boxes • Power Take-Offs • Power Take-Off Joints • Rail Car Drives • Railway Generator Drives • Stampings • Spicer and Auburn Clutches • Parish Frames • Spicer Frames

AIRBRIEFS

(Continued from page 168)

Collier Trophy Awarded to Boeing and the Air Force

For the greatest achievement in aviation during 1955 the Collier Trophy was awarded jointly to William M. Allen, President; his associates at Boeing Airplane Co.; General Nathan F. Twining, and the U. S. Air Force.

Boeing recipients were honored for "conception, development and quantity production of America's first all-jet, long range bomber, the Boeing B-52 Stratofortress." General Twining and the Air Force were cited for sponsoring and making the aircraft operational in 1955 as a "powerful weapon of peace."

The B-52 is a 400,000 lb bomber which flies at 650 mph and can climb to higher than 50,000 ft. Recently a number of these B-52's flew 17,000 miles non-stop using in-flight refueling. A proof of their ability to reach any spot anywhere on the globe.

Missile Expenditures

Much greater emphasis is being placed by the military on the guided missile development and procurement program. This pinpoints the increasing significance of missiles to our national security.

According to the Aircraft Industries Association, \$21 million was spent on missiles in 1951. Last year actual missile procurement expenditures totaled \$1.168 billion. An increased expenditure of over 50 times in 5 years. For fiscal 1957, \$1.311 is earmarked for missiles.

Build-up of missile procurement has resulted in a decrease of expenditures for military aircraft. In fiscal 1956, \$7.1 billion was spent for aircraft and expenditures for fiscal 1957 are expected to be about \$6.7 billion. Look for more expansion in the missile field.

Army Developing STOL and VTOL Aircraft

Several development contracts have been let by the U. S. Army to aircraft companies to investigate and further develop the STOL (short take-off and landing) and VTOL (vertical take-off and landing) type of flying machine. These machines are much like an airplane when in forward flight and can make very slow or helicopter type of take-offs and landings.

Ryan Aeronautical Co. of San Diego is working on the deflected slip stream principle wherein the blast from propellers is deflected downward by a multi-flap type of wing. Doak Aircraft Co. of Torrance, Calif., is building a rotatable ducted fan machine wherein the shrouded propellers will provide direct thrust for take-off and then be rotated 90 deg to provide forward flight thrust.

Hiller Helicopters is working on the flying platform and a tilting wing VTOL. In this latter design the wings with engine and propellers are tipped from horizontal to vertical to provide direct thrust for take-off and landing.

Other companies are working on similar types and also on such aircraft as a small observation helicopter, a new utility helicopter, a medium cargo helicopter and a flying crane for heavy lift requirements.

Another method to slow down airplanes in flight is being investigated. Called boundary-layer-control, air is blown over wing-flaps and ailerons to maintain a lifting air-flow pattern and prevent breakaway of the air from the wing and flaps usually experienced at the lower speeds.

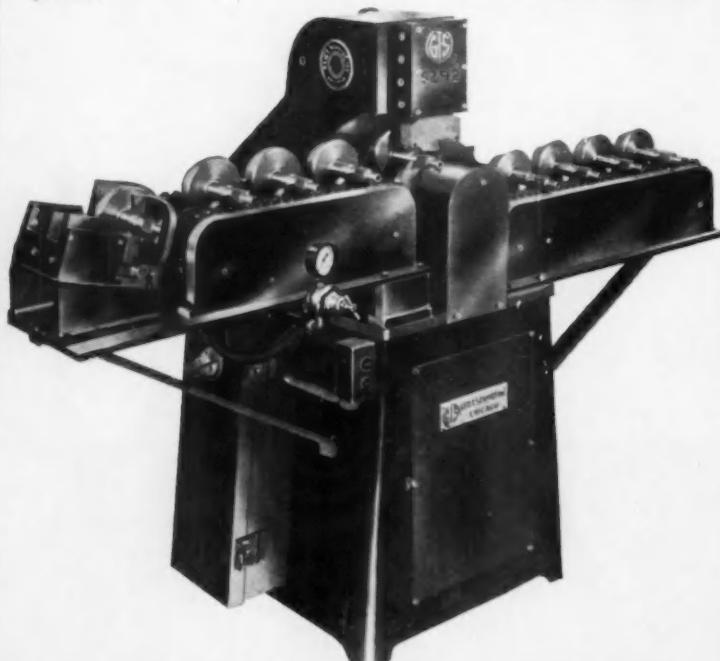
(Turn to page 174, please)

PINION GEAR MARKING?



Model 395

DOES IT
ECONOMICALLY
... AUTOMATICALLY



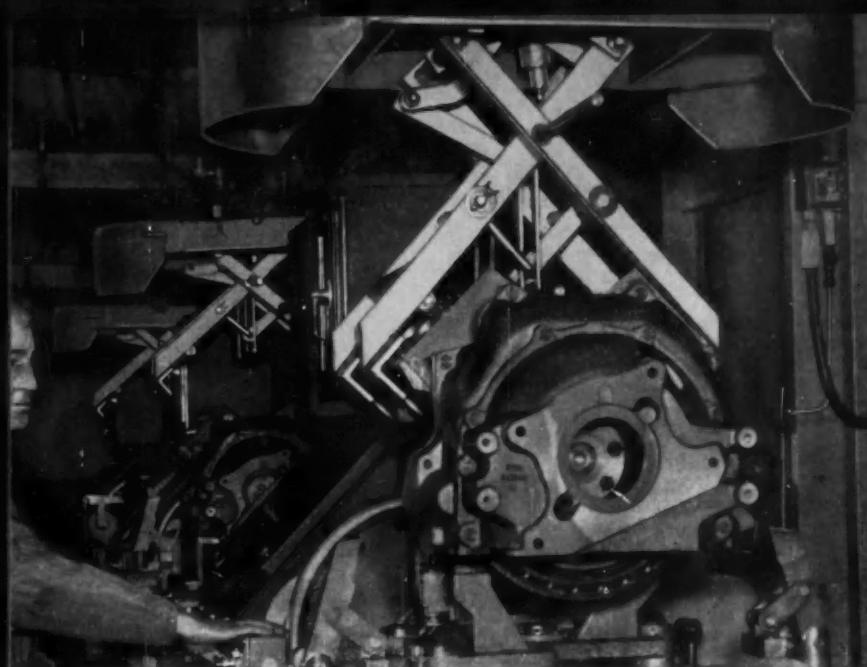
The gears are fed to the spider by means of a chain feed, which carries them under a concave lettering tool. A pneumatic cushion is provided in the die holder to accommodate variations in diameter, insuring uniform depth of marking within both high and low tolerance limits.

FOR FURTHER INFORMATION about this model, or for expert engineering assistance with any industrial marking problem, see your nearest GTS representative, or write direct.

IF IT'S WORTH MAKING,
IT'S WORTH MARKING.

GEO. T. SCHMIDT, INC.

4110 Ravenswood Avenue Chicago 13, Illinois



Over 100 pairs of Heppenstall Safe-T-Tongs are carried by a modern power-and-free conveyor on a prominent automobile producer's assembly line. They pick up partially assembled engine blocks and deliver them to machines which drill their crankshaft area. Next, the tongs lift the blocks and transport them to the following operation.

Heppenstall automatic Safe-T-Tongs, custom built to your individual needs, speed handling, eliminate safety hazards

Heppenstall's fully-automatic Safe-T-Tongs are today's answer to many difficult material handling problems encountered in "automated" production set-ups. Requiring no power, they operate merely by being lowered on the burden to be lifted. They go through their entire cycle of automatic operation quickly, safely, accurately and efficiently.

Safe-T-Tongs are also widely used in the automotive industry where individual lifts of materials are handled by hoist or crane. They do not require any rigging or chains on the load to be lifted, nor ground chainmen — thus eliminating potential safety hazards. Your craneman does the entire job, either from his cab or by remote control.

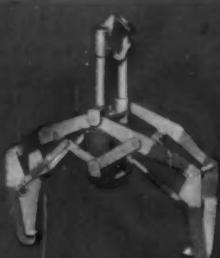
Whatever your particular handling jobs require — regardless of shapes, weights or sizes — Heppenstall tongs, engineered specially to your individual needs, will help you economically speed materials handling operations with greater efficiency and safety.

For complete information and technical assistance contact Heppenstall Company, New Brighton, Pa. Sales offices and representatives are located in principal industrial centers.



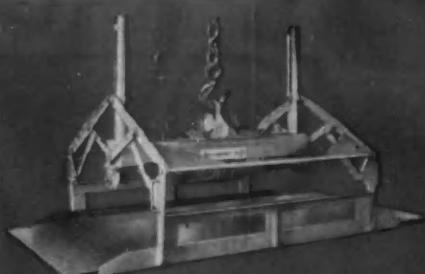
Heppenstall

...tongs for every automotive lifting problem



Motorized Horizontal Coil Tong

Back and Pinion Horizontal Coil Tong
capable of handling coil widths from
19½" to 52" inches



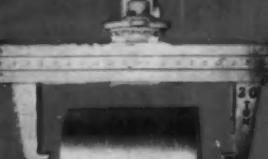
Motorized and Manually Operated
Sheet Lifter



Cast Double "C" Hook



Single "C" Hook



Motorized Rotating Horizontal Coil Tong



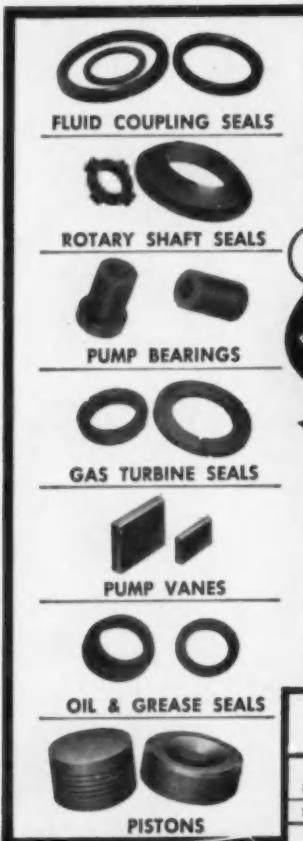
Single Vertical Coil Tong



Motorized Rotating Crane Hook



Carbon-Graphite FOR DESIGN PROBLEMS INVOLVING...



CORROSIVE CHEMICALS OR GASES
LUBRICATION DIFFICULTIES
TEMPERATURE VARIATIONS
CLOSE TOLERANCES OR COMPLICATED SHAPES
WEIGHT RESTRICTIONS
CONTROLLED FRICTION
ELECTRICAL CONDUCTIVITY
ELECTRICAL ARCING
COST
... and many others



Stackpole carbon and graphite—used singly, in combination, or mixed with metal powders—bring design flexibility to hundreds of mechanical engineering problems.

Special grades are constantly being developed to meet specific requirements.

Ask your local Stackpole Field Engineer or send details of your problem for recommendation.

CARBON GRADES FOR MECHANICAL APPLICATIONS

Grade	Hardness	Strength	Apparent Density	Max. Safe Oper. Temp. °F	Typical Applications
SK 18	45	6000	1.75	250	
SK 182	70	5000	1.77	350	
SK 180	80	7000	1.75	650	Corrosive Chemicals
460	80	2000	1.80	1200	
SK 145	90	6000	1.80	800	High speed, High Temperature Aircraft
SK 187	80	9000	1.78	650	
SK 188	85	7000	1.78	650	High Altitude Bearings
SK 152	100	10000	1.75	650	
SK 154	100	10000	1.75	650	Very hard material for bearings operating in liquid
SK 157	75	7000	1.80	250	
SK 176	80	7000	1.80	650	Appliance Seals
SK 105	75	7000	1.80	500	
SK 175	75	7000	1.75	500	Oil Seals
304	80	9000	1.79	650	Vanes & Bearings
331	50	7000	1.74	800	
P87	70	6000	1.68	650	
Y20	40	3000	1.65	650	Turbine Rings
SK 21	45	7000	2.70	250	
SK 67	70	7000	1.77	250	
SK 201	50	7000	1.79	800	
378	65	8000	1.78	650	
G560	45	4500	1.68	800	
HB1	35	3000	1.58	800	
HB1-4	30	4000	1.68	800	

NEW High Temperature Carbon

Thanks to a new Stackpole material, bearings and seals used in gas turbines and other high temperature applications show minimum oxidation at temperatures up to 1200°F compared to the usual limit of 800°F for non-treated materials.

STACKPOLE

STACKPOLE CARBON COMPANY, St. Marys, Pa.

AIRBRIEFS

(Continued from page 172)

New Machine Tool

Specifications have been prepared for a heavy type roll forming machine capable of forming parts from stainless steel as large as 60 in. in diameter and 1 in. in thickness. Its use will provide superior aircraft parts at reduced cost and with increased material utilization.

The specifications were prepared by the Aircraft Industries Association Powerplant Manufacturing Committee which worked closely with the military, machine tool builders and the aircraft manufacturing companies.

Silicon for Transistors

Silicon which has only one part of contaminants in six billion parts of the element can be produced by a new technique reported by Dr. Bernard Rubin of the Air Force Cambridge Research Center.

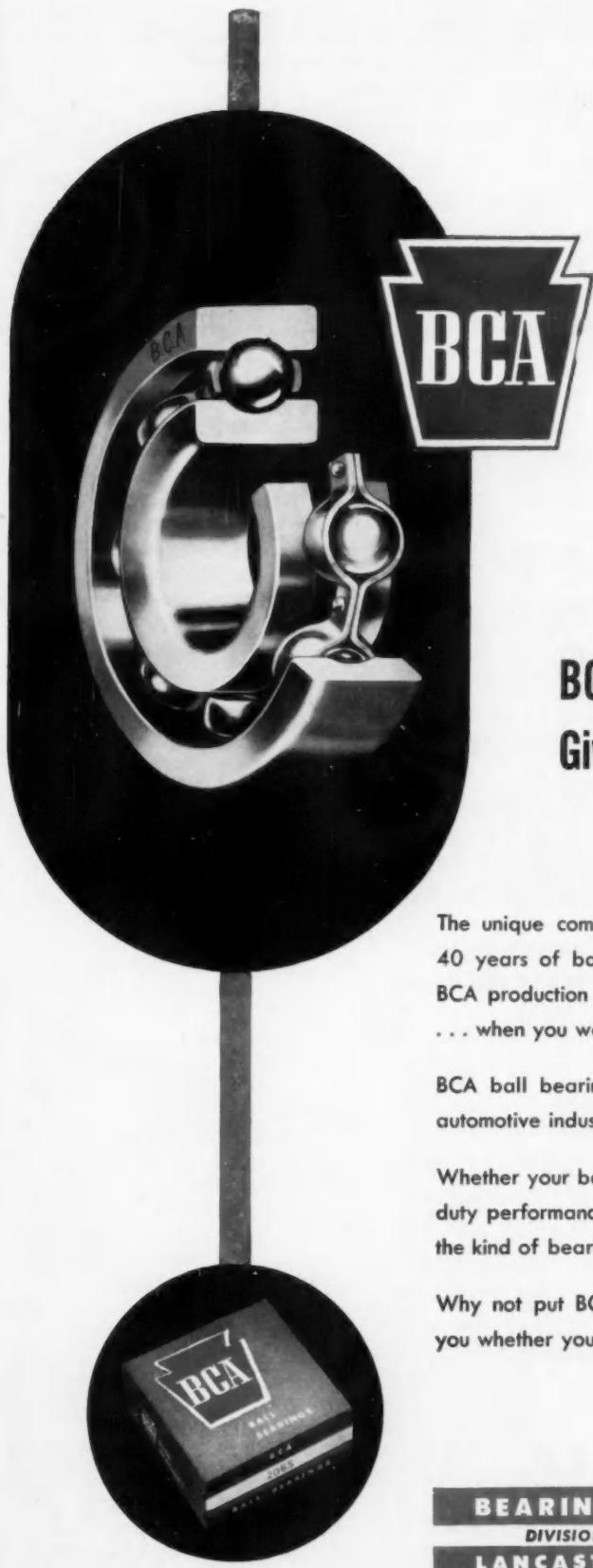
Such nearly pure silicon will permit production of transistors able to withstand heat up to nearly 600 F.

Jet Engine Flies 600,000 Miles Before Overhaul

Six J-57 turbo-jet engines in a B-47 medium bomber have traveled approximately 600,000 miles without having a major overhaul. These engines were originally installed in November 1952 and have been flying the B-47 ever since. This SAC aircraft was one of several 47's which made the first non-stop, combat readiness flight across the Atlantic.

BOOKS ...

RADIO TELEMETRY, by M. H. Nichols and L. L. Rauch, published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, \$12.00. The authors of this book have collected a great deal of hitherto scattered and uncorrelated material in the field of radio telemetry to make a well-rounded presentation of this complicated subject. Combining basic theory and current applications, the book covers such topics as environmental errors and inherent errors, frequency and time domain analysis, modulation and multiplexing, minimum signal strengths and thresholds, sampled data smoothing, and interpolation. With such information as a background, the authors analyze existing telemetry practices and equipment and compare them in terms of minimum required signal strength, crosstalk, susceptibility to environmental errors, and information efficiency.



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The West German Air Force

(Continued from page 71)

Federal Republic for the sake of prestige. The reconstructed German aircraft industry is, for the time being, to concentrate on the repair of aircraft under license. In this connection, Messerschmitt A.G. and Ernst Heinkel A.G., which have joined forces, are to build the French jet trainer Fouga Magister, while the Italian trainer P149

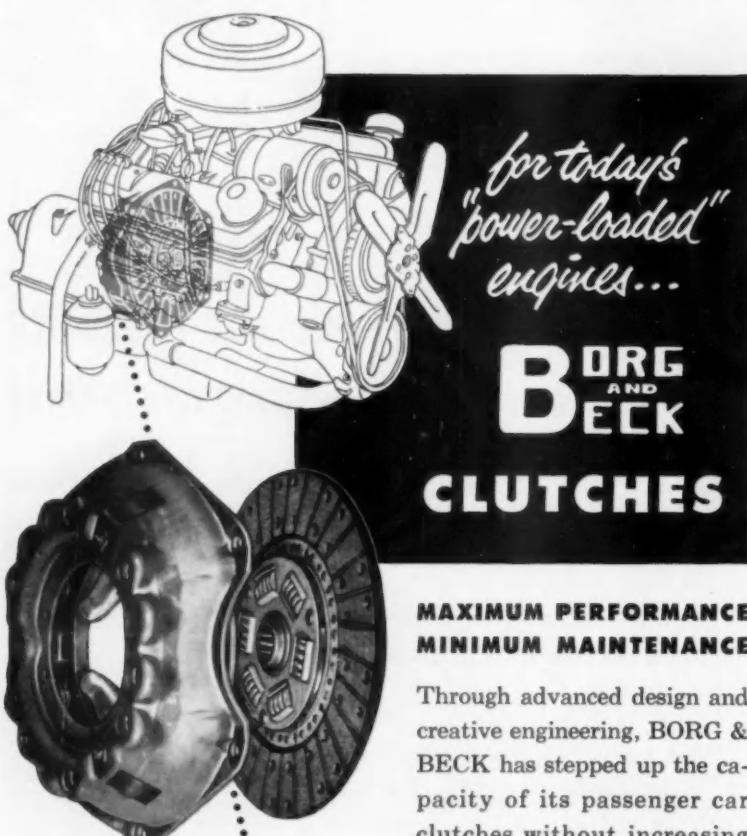
is to be built by Focke-Wulf Flugzeugbau G.m.b.H. in Bremen, in conjunction with the design office of Professor Blume at Duisburg. Meanwhile, the Federal Government has placed an order for 75 training planes type P149D with the Italian firm, Piaggio of Finalmarina. The plane is a fourseater, powered by a Lycoming-GO480 en-

gine, developing 270 hp, which is built in Italy under license of other companies, about to take up or resume aircraft construction. Dornier has developed the DO27, a five-seater, powered by a single 250 hp Continental engine. The German Defence Ministry is reported to have ordered 428 of these machines. The Nord G.m.b.H., formed out of the Blohm & Voss successor firm Hamburger Flugzeugbau G.m.b.H., the Bremen Co. Weser G.m.b.H., the Siebel A.T.G., and Henschel & Sohn of Kassel, are planning to build the French transport Noratlas NRD2501, capable of 800 mph.

A serious problem for the new German Air Force is that of training. With the draft period for the armed forces scheduled to last one and one-half years, the Air Force will have to rely mainly on volunteers, since the training of airmen, including basic training, takes two years. There will probably be no difficulty with regard to pilots, but whether sufficient skilled technicians will be willing to sign on for any length of time, is considered doubtful.

By the time the "Volunteer Law" expires at the end of spring, some 600 German airmen will be in training, mainly at the four American air bases in Bavaria, and at Nörvenich, near Düren. During the initial stage, trainer planes will be furnished by the U.S. Air Force. Veteran pilots of the last war are believed to require about eight months training on modern jet aircraft. Additional training for future flying instructors makes them the most expensive members of the armed forces, their cost, exclusive of pay, being estimated at DM 300,000 per head.

Compared with the German Federal Republic, the German Democratic Republic has the advantage (which operates mainly with regard to training) of having started its air force 2½ years earlier, when air squadrons of the People's Police were first set up. These forces are reported to consist at present of three wings or air divisions, each comprising two air regiments. The first of these regiments in each case is equipped with YAK 18 fighters, and the second with YAK 11 fighters. The



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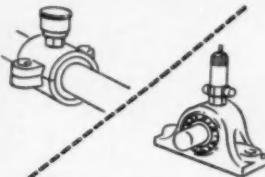
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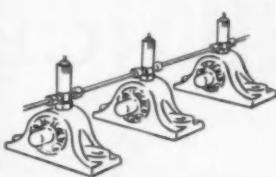
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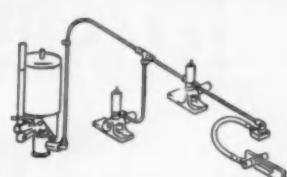
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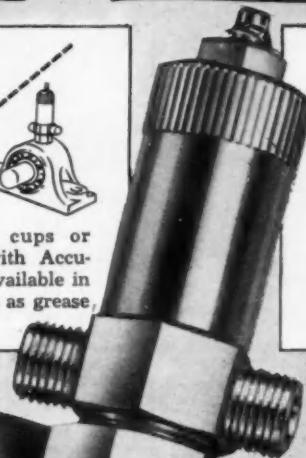
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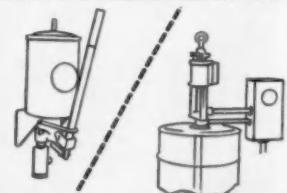


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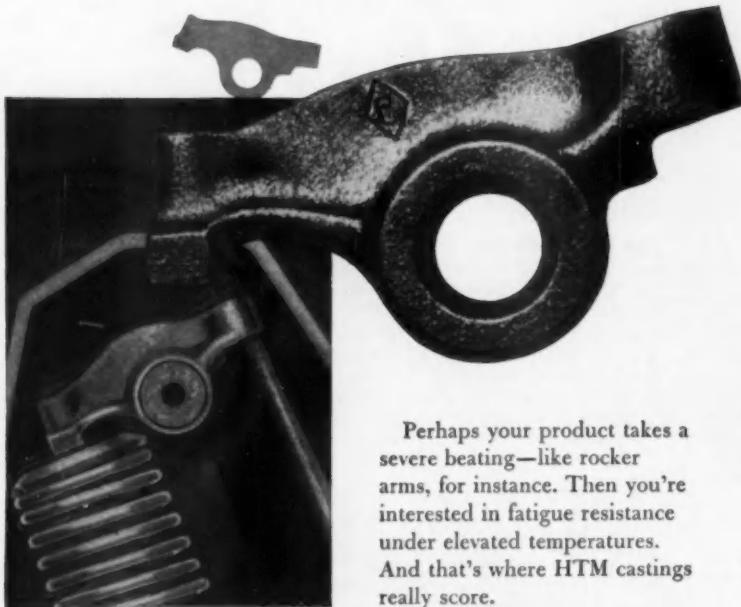
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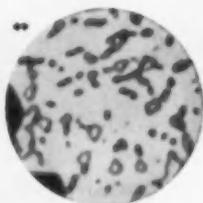
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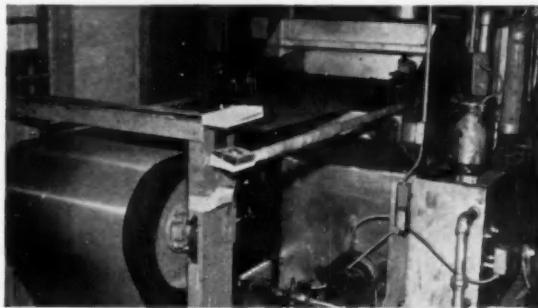
total number of planes is said to be 120 YAK 18, and 180 YAK 11 aircraft. While these planes must be considered antiquated, it seems likely that more advanced designs will be supplied under the Warsaw pact.

BOOKS ...

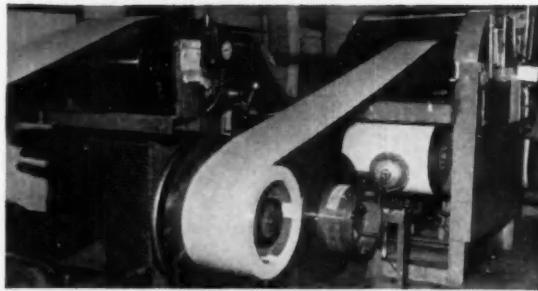
METALLURGY, by Carl G. Johnson and William R. Weeks, published by American Technical Society, 848 East 58 St., Chicago 37, Ill. Price, \$6.50. The fourth edition of this metallurgical survey has been greatly enlarged to include an entirely new chapter on recently developed metals—titanium, zirconium, indium, and vanadium—as well as additional information on bearing alloys, aluminum alloys, alloy steels, copper and copper alloys, cast iron, and heat treatment. The book emphasizes the principles and practices that govern the selection, testing and treatment of metals and discusses their practical application to the problems of design and production. Over 100 photo-micrographic illustrations aid the reader in understanding the structure of metals. Equipment used in and methods of making microscopic examinations are explained in easy-to-understand language. This book can be recommended to anyone who is concerned with the design, shaping, sizing, and fabrication of metal products.

MY FORTY YEARS WITH FORD, by Charles E. Sorenson, published by W. W. Norton Co., Inc., 55 Fifth Avenue, New York 3, N. Y. Price, \$5.00. This is the inside story of the creation of a vast business empire, told by a man who was in on it almost from the start. The author, sometimes known as "Henry Ford's man," sometimes as "Castiron Charlie," has drawn on his rich experience with the Ford Co. to write an exciting narrative that includes the birth of the Model T, the early conflicts with the Dodge Brothers, the initiation of the five-dollar day, and the development of the moving assembly line—a conception that revolutionized the world of industry. Mr. Sorenson does not pull his punches: he gives praise where it is due, but he does not hesitate to criticize the fabulous personality who is the main subject of his story—a story, in the author's words, "of Mr. Ford's greatest success and of his most tragic failure."

VISION: A SAGA OF THE SKY, by Harold Mansfield, published by Duell, Sloan & Pearce, Inc., 125 East 30 Street, New York 16, N. Y. Price, \$5.00. This is a narrative account of the evolution of one company from the earliest days of aviation to the present. The history of the Boeing Airplane Co. is largely the story of some of the most famous airplanes of recent times—the Flying Fortress, the Superfortresses, the B-47, and the intercontinental jet bomber, the B-52. The author, who is director of public relations and advertising for the company, stresses the fact, however, that this book is primarily about people rather than airplanes—about the engineers who designed the airplanes, the men who produced them, and the test pilots and Air Force men who flew them. It is the story of one company's coming of age in a period that has witnessed most of the struggles and triumphs of the airplane industry.



Strip is re-coiled after its treatment with Bonderite, corrosion resistant paint bond.



Painted metal is slit to desired width and coiled again as it emerges from finishing machine.



Re-coiled, finished metal is cut, formed, and inspected here. No loss of paint adhesion.



Painted stock is fed into punch press for blanking into various shapes and sizes.

Photos courtesy Hastings Aluminum Products, Inc.

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INDUSTRY *Previews and Reviews*

(Continued from page 49)

be attainable estimates of American motor vehicle production, indicates that the rubber industry in the United States will consume about 1,500,000 tons of new rubber in 1957 and could establish a new consumption record.

At least 61 per cent of the total new rubber consumed in this country

this year was domestically-produced man-made rubbers, compared with 58.5 per cent in 1955.

Production of tree rubber is not expected to exceed 1,900,000 tons this year, or in 1957, and there is little possibility of an increase before 1960, if then.

The remainder of the world de-

mand must be supplied by man-made rubbers. Constructive action by private industry, following the purchase of man-made rubber facilities from the United States government in 1955, and early in 1956, has made possible ample production capacities in this country.

Further expansions now under way should increase the nation's capacity for production of man-made rubbers from the present 1,355,000 to 1,645,000 tons by the end of 1957. By the end of 1958, free world capacities will approximate 1,990,000 tons. The existing and planned capacities are ample to meet the probable demand through 1958 and perhaps through 1960.

In 1957, the rubber industry estimates that it will manufacture 111,000,000 tires, as compared with 104,000,000 tires in 1956. This expected increase, according to E. J. Thomas, president of The Goodyear Tire & Rubber Co., will come from a larger renewal tire market, but mainly from more tires for original equipment on new vehicles. These plans are based on a production in 1957 of 6,500,000 passenger cars and 1,200,000 trucks.

Notable has been the continued switch to lower diameter and larger cross-section tires; the increased use of tubeless construction; the growth in very large tires for off-the-road hauling such as earthmoving; the increased use of synthetic rubbers; the shift almost completely from cotton to rayon, and now the rapidly increased use of nylon; and the development of safer and better tires.

Record rubber industry sales of \$6 billion in 1957 and an annual rate of seven billion dollars by 1960 were forecast by H. E. Humphreys, Jr., president of United States Rubber Co.

An increase in automobile production will boost the sale of the many other rubber industry products which go into new cars, according to Mr. Humphreys. Among these are foam rubber, plastic-coated and other fabrics for upholstery, a growing number of plastic items for interior trim and numerous rubber products for seals, gaskets, hose and mountings.

William O'Neil, president of The General Tire & Rubber Company, foresees 1957 as the beginning of a new growth era in rubber resulting from the industry's tremendous research and development efforts.

Mr. O'Neil cited the rubber air springs for automobiles and trucks, in which General Tire has pioneered research and development, as one of the new products that will create an entirely new demand on the industry's facilities.

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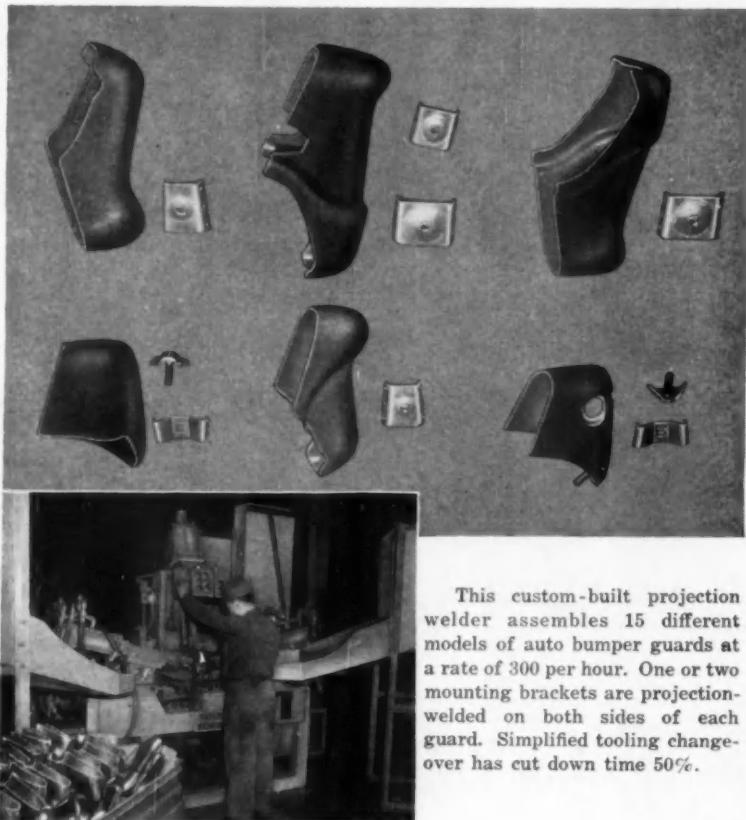
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development, the design engineers of the leading automotive companies are about to accept the air spring for passenger cars, Mr. O'Neil reports. Many of the major manufacturers plan to feature this new development on their '58 models.

PETROLEUM

IN 1956, the petroleum industry, faced with a record demand from the American consumer and from Europe (as a result of the Suez crisis), met the challenge by producing more oil than ever before.

Although it will be at least April before tankers start moving through the Suez Canal again with oil from the Middle East, the industry as well as U. S. Government officials are confident that there will be no shortages or threat of rationing.

The industry's ability to meet the demands of both American and European markets under emergency conditions are attributed by Frank M. Porter, president of the American Petroleum Institute, to long-range modernization and expansion programs.

In his year-end report on the progress and accomplishments of the domestic industry during the past year, Porter reports that total supply and demand, including both import and export, exceeded nine million barrels a day for the first time in history. Total supply averaged 9,376,000 barrels a day, up 596 million barrels over 1955's peak. Total demand averaged 9,270,000 barrels a day, an increase of 490 million barrels a day over last year.

Domestic supply averaged 7,956,000 barrels a day; domestic demand averaged 8,879,000 barrels a day.

For the year as a whole, petroleum production in 1956 was estimated at 2 billion 912 million barrels, an increase of 163 million barrels over 1955. This consisted of 2 billion 620 million barrels of crude oil, and 292 million barrels of natural gas liquids. All three of these figures are all-time highs and represent one-year increases of 135 million barrels of crude oil, and 28 million barrels of natural gas liquids.

Production of natural gas also rose substantially, going up to 12 trillion 700 billion cu ft gross. This, too, is an all-time record, and represents an increase of 840 billion cu ft gross over the previous peak set in 1955.

Stocks of crude oil and products at the end of the year were estimated at 753 million barrels. This is a record-breaking figure, with the biggest share of the 1956 increase represented

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by natural and refined products rather than crude oil.

Well completions also edged upwards, showing a year-end total of 58,850. Ostensibly, this represents an increase of 2,184 wells over the 1955 record, but in actuality the breakdown shows that roughly three-fourths of these were either service wells or dry holes. Thus, total well completions went up only slightly, and there is a strong likelihood that the number of oil wells will show a slight decrease for the first time in the last half-dozen years.

Internationally, the U. S. oil indus-

try fared somewhat better than it has in recent years. Its production of 2 billion 620 million barrels of crude oil represented 44.57 per cent of the world's total of 5 billion 879 million barrels. This put a halt, temporarily at least, to the decline in U. S. production in relation to that of the rest of the world. Last year's crude output was 44.10 per cent, so the margin is only slight indeed. But again, this is only a marginal affair, since the primary reason for the change is the curtailment of Middle East production rather than the increase in U. S. production.

MATERIAL HANDLING

THE 1957 sales of material handling equipment will maintain the record-breaking level of 1956 and possibly exceed it by 5 per cent, according to the Directors of The Material Handling Institute.

During 1956 material handling equipment sales reached their highest peak in the history of the industry. Unit and dollar sales for this year are more than 20 per cent higher than the industry's banner year of 1955. Maintaining this high level of sales or exceeding it by 5 per cent will represent a continued high level of production and sales for most phases of the industry during the coming year.

The manufacturers of handling equipment look for broader use of mechanical handling equipment by more companies—especially smaller companies. Another factor influencing the '57 outlook is the continually rising cost and decreasing availability of labor for manual handling.

Factors preventing a more optimistic outlook for the coming year include the possible shortages of steel in unlimited amounts and generally tight money which may slow-up some capital expansion programs. Another consideration mentioned by the directors is the fact that the automotive industry may not be as strong a factor in the sale of material handling equipment in 1957 due to extra heavy 1956 purchases.

However, the directors look for other industries such as furniture, textiles, building materials, construction and lumber to expand their material handling programs.

ROAD BUILDING EQUIPMENT

LEWIS W. PRENTISS, the executive vice president of the American Road Builders' Association, predicts that total volume of highway construction in 1957 will reach \$5.6 billion; in 1958 or 1959, when the effect of the full interstate authorization of \$2.2 billion per year is felt, the total should reach \$6.5 billion. Thereafter, it is expected that the highway construction level will rise gradually and probably reach \$8 or \$8.5 billion per year by 1969 or 1970.

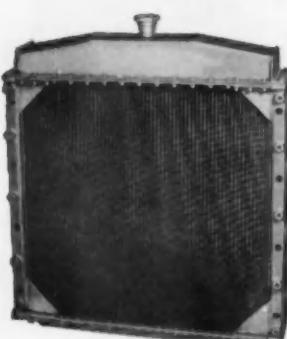
To meet these totals, highway contractors must replace obsolete equipment with new units, and thus the equipment sales outlook is bright for the coming year and future. It is



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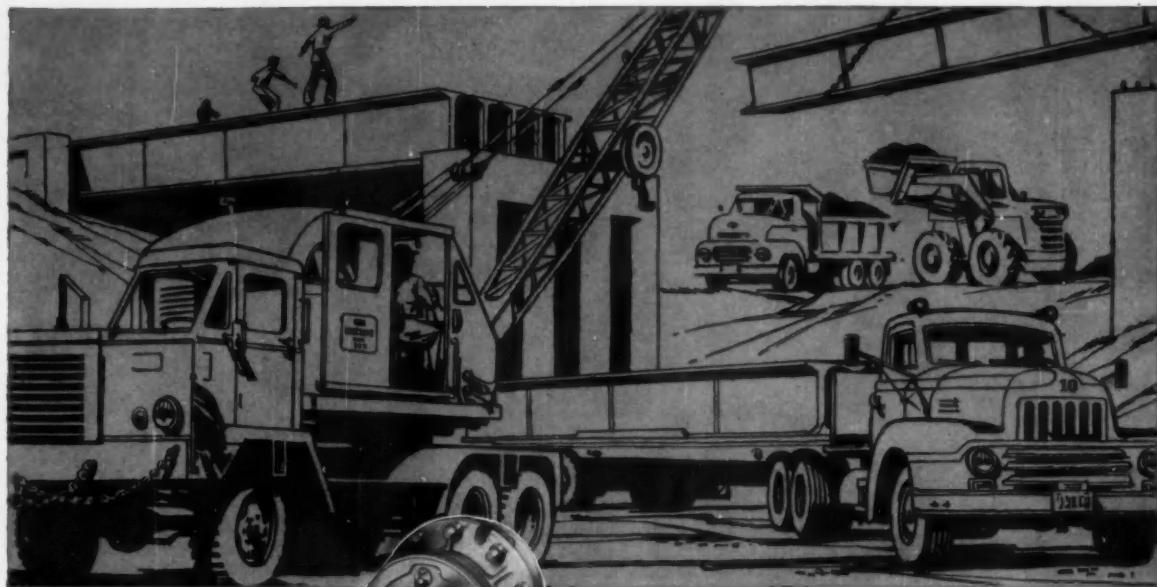
California Representative E. E. Richter & Son,
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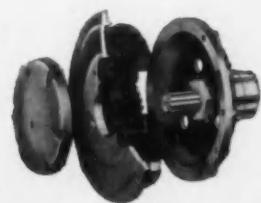
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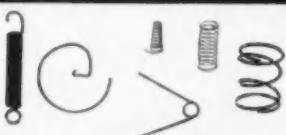
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AUTOMATIC
 SPRING COILING CO.
 4048 West Thorndale Ave., Chicago 30, Ill.

likely that total highway construction equipment demand in 1957 will approximate 94,000 units with a sales value of over \$900 million.

In addition, highway maintenance equipment demand should produce sales of approximately 50,000 units with a value of \$245 million. The total demand for equipment in highway construction and maintenance during 1957, therefore, could amount to some 144,000 units with a sales value of \$1.2 billion.

TITANIUM

T. W. LIPPERT, manager of sales and technical service, Titanium Metals Corp. of America, says that for the six-year-old titanium metal industry, the year 1956 was characterized by steeply declining price curves, record-shattering production volume, and very heavy capital equipment commitments to more than double production in 1957. The industry also established new high levels of metallurgical quality, greatly expanded the recycling of mill scrap, and initiated production of heat-treated alloy sheet of unprecedented strength, size and gage uniformity.

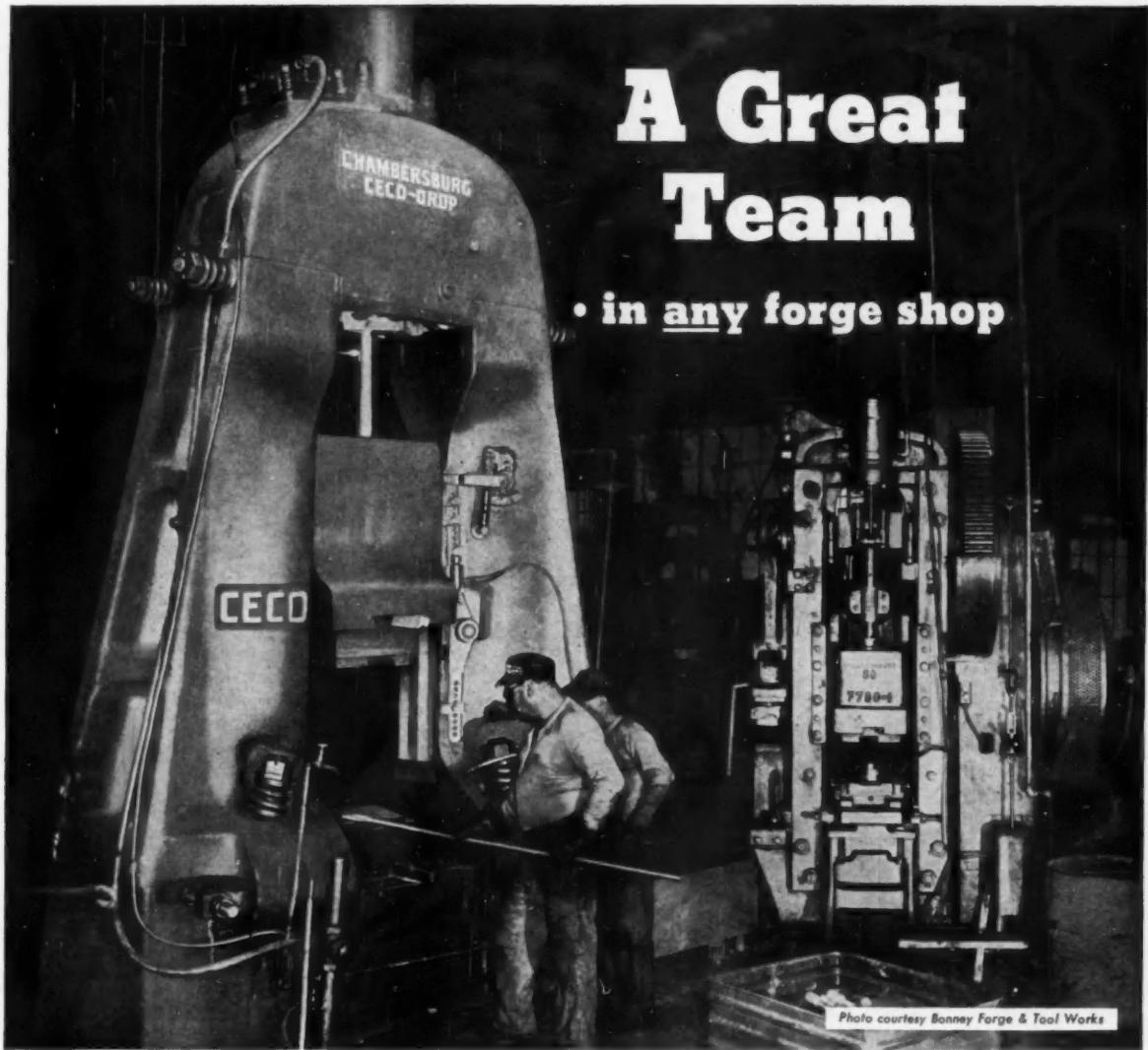
Production of finished mill shapes, in 1956, totaled 10,600,000 lb, which was about 25 per cent higher than the most optimistic first-of-the-year estimates. The mill products had an estimated market value of \$130 million. The record year was particularly impressive in view of the interference in rolling operations caused by the mid-summer steel strike.

To support the 1956 production of 10,600,000 lb of finished mill products required an output of about 23,000,000 lb of ingot metal. This, in turn, consumed some 20,000,000 lb of the pure basic raw material, titanium sponge. The difference of 3,000,000 lb represented the weight of alloy additions and recycling of titanium scrap.

Total sponge metal production, in 1956, jumped ahead to about 29,000,000 lb, some 9,000,000 lb more than was required to support finished metal shipments. This excess sponge, of about \$28 million estimated market value, was blotted-up by in-plant inventory build-ups and some Governmental contractual purchasing.

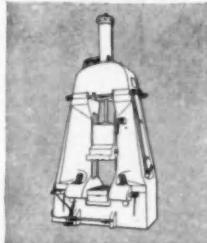
AUTOMOTIVE INDUSTRIES . . .

*Is your News Magazine of
 Automotive and Aviation
 MANUFACTURING*



A Great Team

• in any forge shop



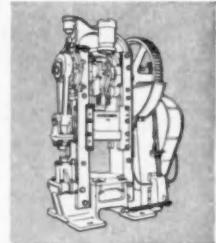
**CHAMBERSBURG
CECO-DROP**

- Piston-lift • Gravity drop
- Costs less to operate
- Forges more minutes per hour
- Forgings made faster
- Operation is easier and safer
- Maintenance is cheaper
- Full stroke or short stroke without interruption
- Over 400 in service in over 100 forge shops

Ceco-Drop and Trimmer • for top production

When the chips are down, it is continuous, trouble-free, quality production that puts you ahead of competition. That fact explains why the Ceco-Drop (in combination with the "indestructible" Chambersburg Trimmer) has become in nine short years, the standard gravity drop hammer of the forging industry.

Write for descriptive Bulletins



**CHAMBERSBURG
FORGED STEEL SIDE
TRIMMING PRESS**

- Exceptional strength
- Jam-proof. Functions perfectly after stall-test
- Uses minimum floor space
- Accessible front and back
- Friction-slip Flywheel
- Interlocking forged steel side construction
- Low power consumption
- Safe
- Single or Double Crank

**CHAMBERSBURG ENGINEERING COMPANY
CHAMBERSBURG**
PENNSYLVANIA
— ALSO BUILDERS OF THE IMPACTER —

Sharp, clean edges
of Shuford's SHURTAPE.
make the "finish" job better!



No paint "build-up" with
this pressure-sensitive
paper masking tape!

For a masking tape that does a better job and strips easy off the roll . . . use Shuford's SHURTAPE CP-11 with rubber impregnated crepe paper backing!

Its extreme flexibility permits conformity to curves . . . it adheres instantly and strips clean without tearing . . . leaves paint primer in place.

Actual production line tests prove that SHURTAPE performance is outstanding even under extreme conditions of over one hour exposure at temperatures of 300° F for two bake cycles.

There's no paint build-up by brush or spray-gun because of the thin gauge and sharp, clean edges of Shuford's SHURTAPE!

There is a high temperature, stain-resistant Shuford's SHURTAPE for all masking applications.

... Write for complete information about Shuford's SHURTAPE
... a complete line of pressure-sensitive paper tapes.

CLOTHES LINES • TWINES
PRESSURE-SENSITIVE PAPER TAPES
SASH CORDS • WEATHER STRIPPING
COTTON & RAYON YARNS • EXTRUDED PLASTICS

World's Largest Manufacturer of Cotton Cordage



New Defense Facilities

SUPPLEMENTING the list of Certificates of Necessity issued up to November 14, authorizing new or expanded defense plant facilities for the manufacture of automotive and aviation war goods which was published in the December 15 issue, page 106, of AUTOMOTIVE INDUSTRIES, the following additional certificates were announced by the Office of Defense Mobilization, covering November 15 to December 26, inclusive.

The figure appearing in parentheses is the percentage authorized in respect to actual fast tax write-offs.

AIRCRAFT PRODUCTS COMPANY, Bridgeport, Pa.

Military aircraft parts—\$53,690 (55)

BE-GE MANUFACTURING CO., Gilroy, Calif.

Army ordnance parts—\$126,500 (45)

BENDIX AVIATION CORP., Bendix Products Div., South Bend, Ind.

Military aircraft parts—\$325,823 (65)

Military jet engine parts—\$24,900 (40)

BENDIX AVIATION CORP., Pacific Div., North Hollywood, Calif.

Military aircraft equipment—\$261,517 (65)

BENDIX AVIATION CORP., Utica Div., Utica, New York

Military aircraft parts test facility—\$235,528 (60)

BRIDGEWATER MACHINE CO., Akron, Ohio

Military aircraft parts—\$171,855 (70)

THE CESSNA AIRCRAFT COMPANY, Wichita, Kansas

Military aircraft—\$2,508,050 (60)

COLLINS RADIO CO., Cedar Rapids, Iowa

Electronic equipment for military aircraft—\$41,666 (65)

COLLINS RADIO COMPANY, Dallas, Texas

Military aircraft equipment—\$40,341 (65)

DOUGLAS AIRCRAFT CO., INC., El Segundo, Calif.

Military aircraft—\$112,207 (65)

DOUGLAS AIRCRAFT COMPANY, Santa Monica, Calif.

Military aircraft—\$805,151 (65)

THOMAS A. EDISON, INC., West Orange, New Jersey

Military aircraft instruments—\$33,956 (65)

EX-CELL-O CORP., Elwood, Indiana

Military aircraft engine parts—\$101,728 (65)

THE FENN MANUFACTURING CO., Newington, Conn.

Military aircraft parts—\$160,908 (65)

G. E. TOOL CORP., Farmingdale, L. I., New York

Military aircraft parts—\$54,502 (70)

GENERAL DYNAMICS CORP., Convair Div., San Diego, Calif.

Military aircraft—\$1,874,292 (65)

GOODYEAR AIRCRAFT CORP., Litchfield Park, Arizona

Military aircraft parts—\$254,328 (65)

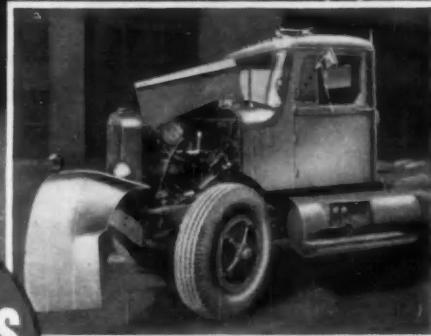
GOODYEAR AIRCRAFT CORP., Akron, Ohio

Military aircraft parts—\$109,108 (65)

(Turn to page 190, please)



**"The average life of
these CONTINENTAL ENGINES
has been 400,000 miles"**



TALK ABOUT CONVENIENCE! Swing-away front fenders of Brockway's Model 258-W make it easy to get at the engine for adjustment, inspection, or servicing. The five units at left above are powered by Continental R-6572 engine, running on LPG. They bring to 76 the number of Continentals in the Ritter fleet.

TRANSPORTATION GASOLINE ENGINES

Model	Cyl.	Bore	Stroke	Disp.	Bore Engine H.P.
N4062	4	2 1/2	3 1/2	62	26.3 @ 3500 RPM
Y4069	4	2 1/2	3 1/2	69	28.0 @ 3500 RPM
Y4091	4	2 1/2	3 1/2	91	36.0 @ 3400 RPM
F4124	4	3	4 1/2	124	47.0 @ 3200 RPM
F4140	4	3 1/2	4 1/2	140	52.0 @ 3200 RPM
F4162	4	3 1/2	4 1/2	162	58.0 @ 3200 RPM
F6186	6	3	4 1/2	186	77.0 @ 3500 RPM
F6209	6	3 1/2	4 1/2	209	90.0 @ 3500 RPM
F6226	6	3 1/2	4 1/2	226	98.8 @ 3500 RPM
F6244	6	3 1/2	4 1/2	244	105.0 @ 3750 RPM
M6271	6	3 1/2	4 1/2	271	96.5 @ 3000 RPM
M6290	6	3 1/2	4 1/2	290	108.0 @ 3000 RPM
M6330	6	4	4 1/2	330	125.0 @ 3000 RPM
M6363	6	4	4 1/2	363	146.0 @ 3000 RPM
B6371	6	4 1/2	4 1/2	371	123.5 @ 3000 RPM
B6427	6	4 1/2	4 1/2	427	142.0 @ 3000 RPM
K6271	6	3 1/2	4 1/2	271	114.5 @ 3200 RPM
K6290	6	3 1/2	4 1/2	290	123.0 @ 3200 RPM
K6330	6	4	4 1/2	330	147.0 @ 3200 RPM
K6363	6	4	4 1/2	363	162.0 @ 3200 RPM
T6371	6	4 1/2	4 1/2	371	143.8 @ 3000 RPM
T6427	6	4 1/2	4 1/2	427	170.0 @ 3000 RPM
U6501	6	4 1/2	5 1/2	501	178.0 @ 2600 RPM
R6513	6	4 1/2	5 1/2	513	192.0 @ 2800 RPM
R6572	6	4 1/2	5 1/2	572	220.0 @ 2800 RPM
R6602	6	4 1/2	5 1/2	602	232.0 @ 2800 RPM
S6749	6	5 1/2	5 1/2	749	250.0 @ 2800 RPM
S6820	6	5 1/2	5 1/2	820	275.0 @ 2800 RPM
V8603	8	4 1/2	4 1/2	603	240.0 @ 3200 RPM

TRANSPORTATION DIESEL ENGINES

Model	Cyl.	Bore	Stroke	Disp.	Bore Engine H.P.
TD6427	6	4 1/2	4 1/2	427	116.0 @ 2400 RPM
RD6572	6	4 1/2	5 1/2	502	172.0 @ 2400 RPM
VD8603	8	4 1/2	4 1/2	603	182.0 @ 2800 RPM
SD6802	6	5 1/2	5 1/2	802	225.0 @ 2200 RPM

EXCERPT FROM A LETTER FROM THE H. R. RITTER TRUCKING CO., PARAMUS, N. J., TRANSPORTERS OF PETROLEUM PRODUCTS:

"Sixty per cent of our fleet is powered with Continental motors. We covered 2,433,600 miles last year and delivered 100,865,200 gallons of product, or approximately 322,000 tons, over level and mountainous terrain. The average life of these Continental motors has been 400,000 miles, with re-building costs approximately \$391 per 100,000 miles. Since using our first Continental, in 1946, we have replaced only one crankshaft. In all the units we have re-built, we have never ground a shaft. All in all, the fine performance given us by Continental motors has greatly contributed to our success as an over-the-road operator."

(Signed) "C. W. Rosencrans
Vice president."

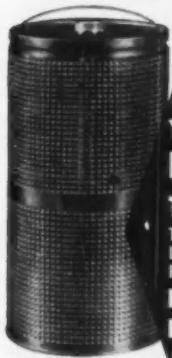


Continental Motors Corporation

MUSKEGON • MICHIGAN

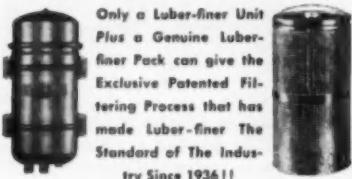
6 EAST 48TH STREET, NEW YORK 17, NEW YORK • 6218 CEDAR SPRINGS ROAD, DALLAS 9, TEXAS • 3017 SOUTH SANTA FE AVENUE, LOS ANGELES 35, CALIFORNIA • 1911 GAYLORD DRIVE, EAST POINT (ATLANTA) GEORGIA

THERE'S NO SUBSTITUTE for LUBER-FINER'S ENGINEERED PROTECTION



YES! IT'S WHAT'S
INSIDE
THAT COUNTS
The Efficiency of
Luber-finer's Exclusive
Patented Process
HAS NEVER
BEEN EQUALLED!

USE ONLY GENUINE
Luber-finer
DIESELPACKS



Only a Luber-finer Unit
Plus a Genuine Luber-
finer Pack can give the
Exclusive Patented Fil-
tering Process that has
made Luber-finer The
Standard of the Indus-
try Since 1936!!

**THERE'S A LUBER-FINER MODEL
FOR EVERY TYPE OF ENGINE—
EVERY TYPE OF OIL!!**

LUBER-FINER PACKS AVAILABLE

1. REFINING PACK

Introduced to the public in 1935 for use with straight mineral oils, fuel oils, hydraulic oils, and inhibited industrial oils.

2. DIESELPACK

First made available in 1941, the DIESELPACK was primarily designed for use with H.D. detergent compounded oils and has also achieved outstanding results when used with fuel oils and straight mineral oils.

DON'T BE MISLED BY PRICE ALONE!

There is no substitute for DIESELPACK'S Patented Filtering Process for H.D. Compounded oils. **AT ANY PRICE!**

The DIESELPACK cleans more oil faster—keeps it CLEAN longer—and gives more service and better engineered protection than ANY of the substitute filtering elements being offered for Luber-finer units.

IT PAYS TO GET THE BEST!

STANDARD OF THE INDUSTRY SINCE 1936

Luber-finer Units are Standard and Optional Equipment on America's Leading Diesel Trucks, Tractors, Stationary Engines.

Write for Complete Information to Dept. 32

LUBER-FINER, INC.
2514 S. Grand Ave., Los Angeles 7

(Continued from page 188)

H. F. & M. TOOL COMPANY, INC., New Haven, Conn.
Military aircraft parts—\$91,286 (55)

HUGHES AIRCRAFT COMPANY, Culver City, Calif.
Military electronic equipment—\$708,075 (65)

HYDRAULIC RESEARCH & MANUFACTURING CO., Burbank, Calif.
Military aircraft parts—\$53,862 (70)

KEARFOTT COMPANY, INC., West Paterson, New Jersey
Military aircraft instruments—\$3,900,000 (40)

LADISH COMPANY, Cudahy, Wisconsin
Special forgings for military end items—
\$10,270,603 (70), \$1,499,405 (65)

LOCKHEED CORP., Georgia Div., Marietta, Georgia
Military aircraft—\$607,618 (65)

MCDONNELL AIRCRAFT CORP., Berkeley, Missouri
Research and development—\$3,684,000 (60)

THE GLENN L. MARTIN CO., Baltimore, Maryland
Military aircraft—\$445,661 (65)

RADIATION, INC., Orlando, Florida
Military aircraft equipment—\$164,000 (45)

ROHR AIRCRAFT CORP., Auburn, Washington
Military aircraft parts—\$806,850 (60)

THE RYAN AERONAUTICAL CO., San Diego, Calif.
Jet engine parts for military aircraft—
46,278 (65) Research and development—
\$500,000 (60) Military aircraft parts—
\$200,000 (60)

SIMMONDS AEROACCESSORIES, INC., Vergennes, Vermont
Military aircraft parts—\$100,000 (45)

THOMPSON PRODUCTS, INC., Minerva, Ohio
Steel castings—\$1,500,000 (65)

UNITED AIRCRAFT CORP., Hamilton Standard Div., Windsor Locks, Conn.
Research and development—\$734,665 (65)

UNITED AIRCRAFT CORP., Pratt & Whitney Aircraft Div., Southington, Conn.
Military aircraft engines—\$33,000 (60)

THE UNITED TOOL & DIE CO., West Hartford, Conn.
Aircraft engine parts—\$97,158 (65)

Southern's

1 - SOURCE SERVICE

Precision-made by specialists!

Wide choice styles, sizes, finishes!

Famous for fast service!

Over 1 billion screws in stock!

Warehoused & distributed nationally!

**SOUTHERN SCREWS BRING YOU
BUILT-IN DEPENDABILITY
—DAY AFTER DAY!**

If your job involves "juggling" to keep assembly costs down while production speeds up—better let us show you how Southern Screw can help solve your problems . . .

Southern are screw specialists . . . make fasteners exclusively . . . and we manufacture every screw we sell! . . . Famous for service and quality—Southern Screws earn your confidence, once you've tried them!

For catalog, Stock list and Free Samples, write Southern Screw Company, P.O. Box 1360-A1, Statesville, N. C.

Slotted and Phillips, in Steel, Brass, Silicon Bronze, Aluminum and Stainless Steel.

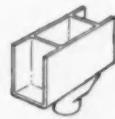
Machine Screws & Nuts • A&B Tapping Screws • Wood Screws •
Stove Bolts • Carriage Bolts •
Wood & Type U Drive Screws •
Hanger Bolts • Dowel Screws



Warehouses:
NEW YORK-CHICAGO-DALLAS-LOS ANGELES



Hammer or Press.....



which is best for your forged product?

Hammers forge some pieces more efficiently than presses; presses work some forgings better than hammers. What is a forging man to do? Easy! Talk with the firm that makes the best in both hammers and presses . . . talk with Erie Foundry Company. We will help you with expert specific advice on the right machine for your forging requirements.

In one instance, Eaton Manufacturing Company's (Marion, Ohio) forge plant decided on this Erie 10,000-lb. Board Drop Hammer to forge 68-lb net flat-back ring gears, 16" in diameter—in a single impression die, straight down, without blocking or pancaking. And, in another instance, Kaiser Aluminum's (Erie, Pa.) forge plant decided to use this Erie Foundry Hydraulic Forging Press with electromagnetic controls, to produce in quantity, their no-draft forgings.

Which is best for you—hammer or press? Talk to the recognized leader . . . Erie Foundry Co. Just call or write.



ERIE

ERIE FOUNDRY CO. ERIE, PA.

World's Greatest Name in Forging Machines—Since 1895

Industry News

(Continued from page 94)

Use Of Winter Tires On Cars Doubled In Past Four Years

The Rubber Manufacturers Association points to an interesting survey which shows how the use of winter tires on automobiles has increased in the past several years. According to the survey, the first such ever made by the industry, an estimated 10.1 million cars were equipped with the special casings last winter, compared with 4.8 million in the 1952-53 winter season.

In actual numbers, there were 20 million winter tires installed on cars in the 1955-56 season, or two per car using them on rear wheels for better traction. This indicates that one out of every five motorists used the tires on his car.

Tire Industry Sees 1957 As Second Best On Record

Rubber manufacturers expect to produce approximately 86.5 million passenger car tires in 1957, or about 1.4 million more than is anticipated

for 1956, according to U. S. Rubber Co. The 1957 figure apparently is based on a total production of 6.5 million cars, since the tire industry estimates that approximately 38 per cent of its 1957 passenger car tire production will go to automobile companies as original equipment.

That figure would give the tire industry its second best year, topped only by 1955. Tire production then hit an all-time high of 97 million as a result of peak automobile production. Combined output of passenger car and bined output of passenger car and truck tires is expected to top the 100 million mark next year.

Transmission Parts Sales Doubled By Federal-Mogul

The continuing rise in preference for automatic transmissions on cars is reflected sharply in the business volume of suppliers which make parts for the self-shift units. Federal-Mogul-Bower, Inc., notes that its dollar volume of automatic transmission parts has more than doubled in the past two years. Automatic transmission parts account for more than 15 per cent of the total volume of the company's Federal-Mogul Div.

(Turn to page 194, please)



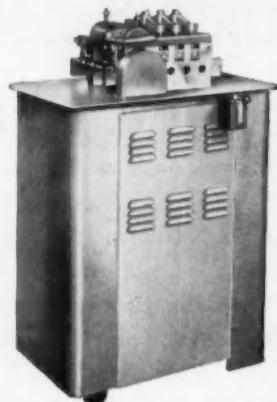
Outstanding success in dozens of markets for Anheuser Busch, The Mennen Company, Blatz Brewing Corp., Chevrolet Dealers, Socony Mobil Oil, Italian Swiss Colony Wine, and other advertisers who want to reach men!

CESAR ROMERO stars in swift-moving international adventures set in the world capitals which headline today's news. Write, Wire, Phone for complete PASSPORT TO DANGER data file.



10 East 44th St., New York 17, Oxford 7-5880

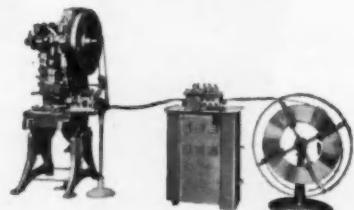
FLEXIBILITY in Stock Straightening



WITTEK

STOCK STRAIGHTENERS

Used in conjunction with a reel stand and automatic feed for punch presses, the Wittek Stock Straightener is a self-contained, motor-driven unit designed for maximum efficiency in the continuous straightening of coiled stock. Standard models handle stock with widths up to 12 inches. An infinitely variable speed drive permits any desired straightening speed so that the proper slack is maintained in the straightened strip between the unit and the press feed.



This typical Wittek automatic production feeding setup includes—Wittek roll feed mounted on the punch press, Wittek stock straightener, and Wittek self-centering reel stand.

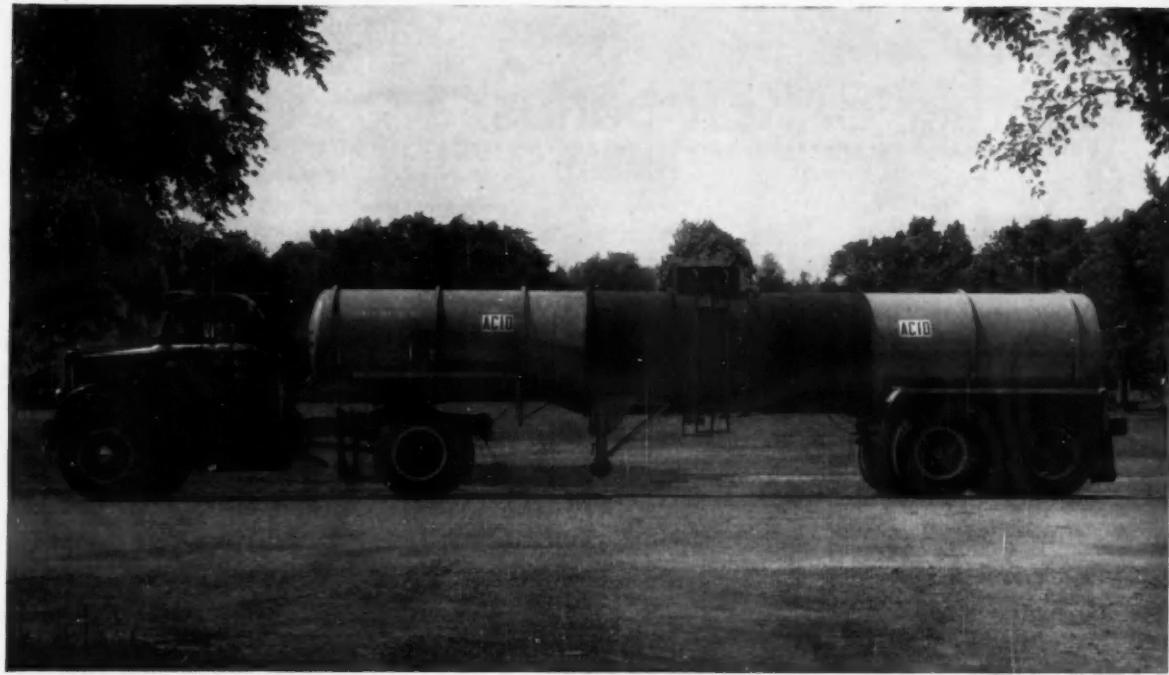
Write for full particulars

WITTEK Manufacturing Co.



1605

4319 W. 24th Place • Chicago 23, Illinois



Leading tank carrier standardizes on Fuller 8-speed ROADRANGER® Transmissions

Fuller 8-speed, semi-automatic ROADRANGER Transmissions will be *standard* in all new tractors purchased by Leaman Transportation Corporation, Leaman Transportation Company, Inc. and Chemical Tank Lines, Inc. of Downingtown, Pennsylvania.

The combination of these three companies comprises one of the largest tank carrier operations in the world. Since 1930 this organization has used hundreds of Fuller Transmissions . . . and recently added 36 new R-46 ROADRANGERS in new

White and International Tractors as part of the standardization on this 8-speed model.

Says D. A. (Dave) Ross, Vice President: "We get the best service from the 8-speed ROADRANGERS in our operation. Some have over 150,000 miles on them, and have not been touched. Our maintenance cost is much less . . . in fact, we haven't had any cost to date since we have had *no trouble*.

"50% of all our mileage on the petroleum hauls is with an empty trailer. With the .577 ratio in the rear axle and 10 x 22 tires, we can maintain a good road speed empty in 8th

gear . . . at approximately 2000 to 2200 rpm with our gas engines. This results in better fuel mileage and better engine life. And, we are able to maintain a higher rpm at all times under a load. Our drivers now say they wouldn't have any other transmission."

For efficient, dependable operation of your trucks, ask your truck dealer now for full details on the easiest-shifting transmission available for your operation. Specify Fuller ROADRANGER Transmissions for faster trip time, lower fuel consumption, longer engine life, less driver fatigue and greater profits.



FULLER MANUFACTURING COMPANY
Transmission Division, Kalamazoo, Michigan

Unit Drop Forge Division, Milwaukee 1, Wisconsin • Shuler Axle Company, Louisville, Kentucky (Subsidiary) • Sales & Service, All Products, Western District Branch, Oakland 6, California and Southwest District Office, Tulsa 3, Oklahoma.

another BAKER bonus



TWIN PULL ... SERVICE IS A SNAP



Many reasons for Baker's twin pull hydraulic feed cylinders. They're out in the open . . . easily accessible for maintenance. Are more compact (3 1/4" diameter). Have adjustable chevron packing. And they're exclusive with Baker. Twin pull can be had on Baker specials—or on Baker Basics, for automation with *standard* machines.

BAKER
AUTOMATION

*Best in the long run
Practical in the short run*

***** CHECK AND MAIL FOR DATA *****

- Twin pull hydraulic cylinders
- Flame-hardened, ground steel or cast iron ways — durable
- Separate Porta-Pak power feed unit — accessible for maintenance
- Big ball bearings throughout, rugged construction

BAKER BROTHERS, INC.
Dept. AI-157, Toledo 10, Ohio

Yes, tell me more about these Baker Bonuses . . .

NAME AND TITLE

COMPANY

ADDRESS

CITY

ZONE STATE

Industry News

(Continued from page 192)

Tin Finds Many Applications In Motor Vehicles of Today

Over 10,000 long tons of tin were used in the nearly 8 million passenger cars and 1.25 million trucks produced in the U. S. during 1955. An additional quantity was used in radios, heaters, and other automotive accessories.

Principal forms in which tin is used in modern cars, trucks and buses are solder, bronze, powdered metal parts, platings, and chemicals. In these forms it is found principally in the electrical system, the radiator, and the fuel system. It may also, depending on the make and model, be in these parts: air cleaner, battery cables, body front end, brakes and controls, camshaft carburetor, clutch and controls, crankcase ventilation, crankshaft and pistons, cylinder block, cylinder head, frame, front axle, fuel pump, headlamps and parking lamps, horn, instruments, oil filter, oil pump, steering, tail and stop lamps, transmission, underbody, valves, water pump and fan, and wiring harness.

Dry Charge Batteries Boost Delco Sales 41%

Growing preference of dry charge batteries over the "wet" type in the automotive replacement market is illustrated in a report from Delco-Remy Div. of General Motors Corp. Delco notes that dry charge batteries are now accounting for more than 65 per cent of its total battery sales in the after-market.

All of Delco's plants are now producing dry charge batteries. Its newest facility in Olathe, Kans., is equipped for total production of dry charge batteries. Since the introduction of the dry charge, Delco's total battery sales have risen 41 per cent, the division reports.

AIME Meetings Set to Cover Steels, High-Temp Materials

The American Institute of Mining, Metallurgical, and Petroleum Engineers will hold special sessions in connection with two forthcoming section meetings.

A regional meeting on drawing-quality steels will be held March 18 and 19 at the Rockham Bldg. in Detroit. A conference on high-temperature materials will be held April 16 and 17 at the Hotel Carter, Cleveland, O.

MORE EFFICIENT DESIGN, IMPORTANT SAVINGS, SIMPLIFIED ASSEMBLY, BETTER APPEARANCE

These are some of the many benefits reported by Design Engineers who have adopted TRU-LAY PUSH-PULLS for remote control operations on literally hundreds of products

Here are typical comments recently received from equipment manufacturers whose machines or implements are equipped with these accurate and dependable remote controls:

Saves Time, Labor and Material

"The use of your flexible Push-Pulls saves us a great deal of time, labor and material. The old linkages frequently required much planning in both engineering and shop which is not required now. On some of our equipment we use Push-Pulls from 10 to 30 feet in length. They operate clutch controls on the Main Power Unit, Feed Conveyors and Delivery Conveyors."

Greater Flexibility of Design

"The principal advantage of Tru-Lay Push-Pulls in our application is that they permit flexibility in locating the control valve in relation to the operator's position."

Cost Less to Install

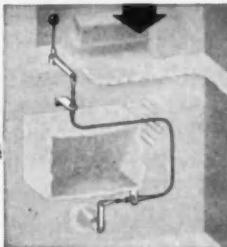
"Tru-Lay Push-Pulls are easier and less expensive to install than linkages for remote control of power take-off,"

TRU-LAY PUSH-PULLS are "Solid as a rod but *Flexible* as a wire rope." This flexibility makes it possible to snake around obstructions . . . permits the ideal arrangement of all elements of remote controls.

Advantages of Tru-Lay Push-Pull flexibility and simplicity are pictured below—

TRU-LAY PUSH-PULL

Simple
One Moving Part
Life-Time Service
Life-Time Accuracy
Low over-all Cost
Noiseless



MECHANICAL LINKAGES

Complex
Many Parts
Many Points of Wear
Increasing Back-Lash
Loss of Accuracy
Vibration
Rattles

Construction Equipment and Farm Implements provide good examples of the wide-spread use of these accurate, simple and dependable Push-Pulls. On Power Shovels, Winches, Graders, Road Oilers, Dump Trucks, Snow Plows, Engine-driven Pumps, Crushers, Tractors, Combines, Corn Pickers, Corn Row Sprayers, Corn Detasslers, Orchard Sprayers, Power-driven Tree Trimmers, Tobacco Picking Machines and others . . .

TRU-LAY PUSH-PULLS are operating unfailingly for the remote control of Hydraulic and Air Valves, Brakes, Clutches, Transmissions, Throttles, Chokes, Governors, Power Take-Offs, Spray Nozzles, Vent Directional Fins and on many other applications.

ACCO

Our DATA FILE will answer all further questions



AUTOMOTIVE and AIRCRAFT DIVISION
AMERICAN CHAIN & CABLE



601-H Stephenson Bldg., Detroit 2
2216-H South Garfield Ave., Los Angeles 22 • 929-H Connecticut Ave., Bridgeport 2, Conn.

There is No Worry about Failures or Maintenance Costs with TRU-LAY Push-Pull Remote Controls

Long Life is a matter of record. We have never heard of a Tru-Lay Flexible Push-Pull Control wearing out in normal service. Failures, that sometimes harass users of more complex controls, are eliminated by the use of these simple, positive-action controls.

Dependable Operation of these controls is a certainty, even under the most adverse conditions . . . HOT as jet engines (note: Tru-Lay Push-Pulls are actually performing on hot jet applications) . . . COLD to 70° F below zero . . . SOAKIN' WET . . . ABRASIVE . . . or just plain TOUGH.

Freedom from Trouble is assured because of such features as . . . full protection of the inner, working member by the tough flexible conduit . . . lubrication of the inner, working member for life during assembly . . . seals that keep moisture, dust and other foreign matter out of the unit . . . cold swaging of fittings that makes them integral parts of the control unit.

Accuracy is inherent in the basic design of Tru-Lay Push-Pulls. They are precision products, not gadgets.

Capacity ranges from light jobs up to jobs of 1,000 lbs. input. These Push-Pulls will handle jobs 150 feet or more from the control point.

"Solid as a rod, Flexible as a wire rope" aptly describes Tru-Lay Push-Pull Controls. This flexibility provides positive, remote action whether anchorages are fixed or movable . . . it damps out noise and vibration . . . it greatly simplifies installation of controls by reducing the number of working parts and by making it possible to snake around obstructions.

Adaptability to all sorts of mechanical situations explains, in large measure, the wide-spread application of Tru-Lay Push-Pulls. Standard anchorages, fittings and heads have been designed that meet requirements on approximately 80% of the installations. Simple modifications of these standards, or minor changes in your own design, cover almost every special situation. Our engineers have the know-how on such matters, and will work with you.

For Further Information — The DATA FILE pictured at the left contains six booklets and bulletins that will answer any further questions you may have about this versatile and dependable tool. It is quite likely that this material will point the way to a simplified solution of your remote control design problems. Write for a copy.

for those
little parts
that play
such a big
part...

CALL ON
AETNA



Why do so many leading automotive manufacturers consider Aetna their regular source of supply for vital component parts?

For one thing, they always get the best parts made—of highest quality and uniformity—and at the best price possible. But this isn't all they get for their money. They get PLUS values that carry no price tags.

For instance, because Aetna is such a versatile manufacturer, they get a wide choice of services, the time and money saving advantages of our vast store of tools and the stubborn kind of engineering

help that invariably resolves parts problems the most economical way.

And because of Aetna's advanced quality control-inspection systems, rejections and returns are held to a minimum, saving time, trouble and extra expense for the customer.

See for yourself why Aetna's experience in parts, as well as in bearings, has made it the "can do" company. Just send us a sketch and description of YOUR specific parts problem. We'll promptly return the most economical proposal in keeping with your application and reliability requirements.

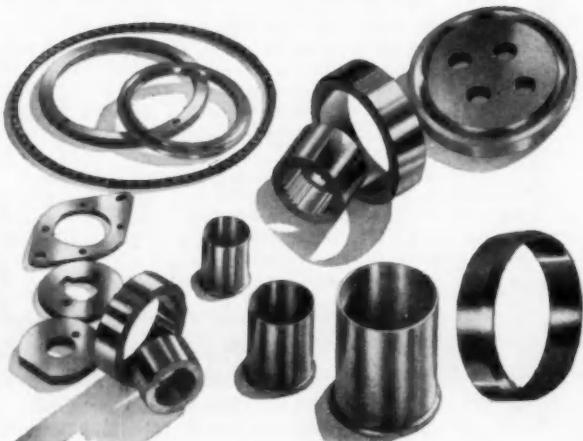
Aetna

BALL BEARINGS • ROLLER BEARINGS • PRECISION PARTS

AETNA BALL AND ROLLER BEARING CO.

Division of Parkersburg-Aetna Corporation

4600 Schubert Avenue • Chicago 39, Illinois
IN DETROIT—SAM T. KELLER, 1212 FISHER BUILDING





Pratt & Whitney's J-57 Turbojet: The most powerful aircraft production engine in the world is rated in the 10,000-pound thrust class.

Why Pratt & Whitney Uses 19 Gear Grind Machines to Guarantee Performance in the World's Most Powerful Aircraft Production Engine

At Pratt & Whitney Aircraft, where finest quality gears and high production are essential to the manufacture of the J-57 Turbojet, 19 new automatic Gear Grind Machines are in daily use. Here is what Pratt & Whitney has to say:

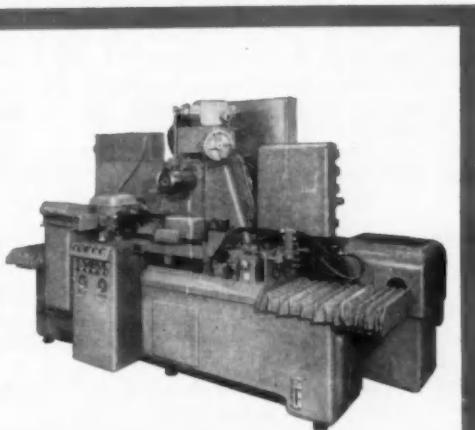
"The new Gear Grind Machines presently used in the aircraft engine division are the first major development in this type of machine since their use at Pratt & Whitney. They were developed in cooperation with Pratt & Whitney engineers to meet the specific and exacting requirements of modern aircraft engine gears. These machines are equipped with a new wheel-trimming feature and a two-speed spindle drive to eliminate burning.

"Another advantage is the relative ease with which the involute profile can be modified."

YOU'LL WANT TO KNOW MORE ABOUT THESE ADDITIONAL ADVANTAGES FOUND IN THE NEW GEAR GRIND AUTOMATICS

- Controlled flow of coolant through the grinding wheel insures non-tempered, case-hardened gears.
- Single or double diamond trimmers are used to assure a perfect blend between the tooth profile and the root fillet.
- Automatic trimming of the grinding wheel assures uniformly accurate work.
- Available as fully automatic machines incorporating automatic loading and unloading.

Write today for comprehensive eight-page brochure which explains the details.



For gears up to 36" diameter.

The Gear Grinding Machine Company

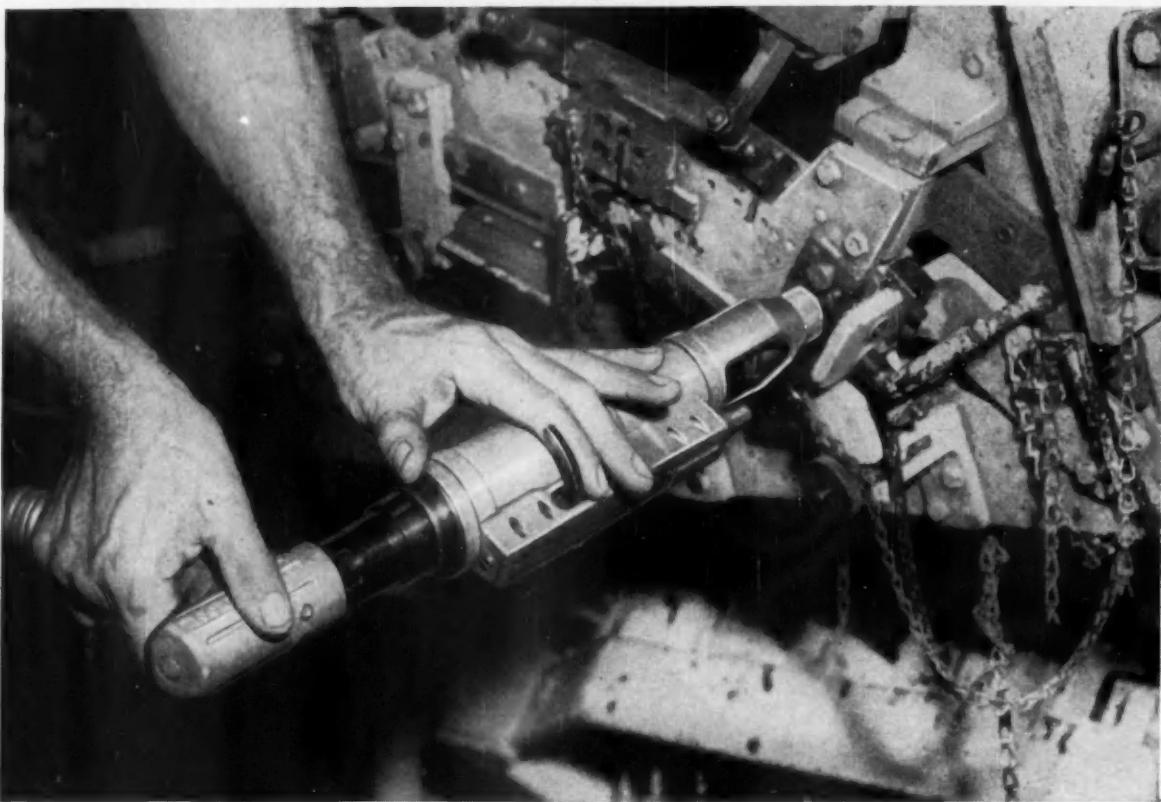
56-B

3903 Christopher, Detroit 11, Mich.

Manufacturers of:

The Detroit Screwmatic 750, Automatic Screw Machines. RZEPPA ("Sheppa") Constant Velocity Universal Joints

Gardner-Denver... Serving the World's Basic Industries



Keller NEW Hard Metals Portable Tool Drills Holes Cleanly at Any Angle

Here is the Keller Tool "K-MATIC"** portable production line drilling unit that embodies the best features of an automatic precision drilling machine and the handy hand drill!

This air-powered unit drills clean, true holes in titanium, heat-treated stainless steel and other hard metal alloys—*on the production line*.

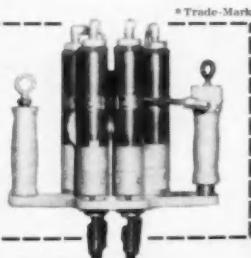
Features of the "K-MATIC"

- Handles drills up to $\frac{3}{8}$ ".
- Positive differential lead screw prevents plunging on break-through.
- Drills sandwich construction with uniform penetration.
- Drills so cleanly that reaming is often unnecessary.
- Drill bit returns automatically, quickly.
- Single-lever operation—requires no special operator skill or training.
- Adjustable stop prevents "drilling air."

- Instant bit return prevents damage during drilling cycle.
- Develops up to 1000-lb. thrust.
- Light in weight—"K-MATIC" attachment weighs under 5 lb. . . . is only 12" long, with $1\frac{1}{4}$ " stroke length.

For complete information and specifications, write Gardner-Denver Company—Keller Tool Division, Grand Haven, Michigan.

Another new time saver
... cost shaver!
Keller Tool multiple-spindle, medium-torque (2 to 24 foot-pounds) nut setter or screw driver. For close bolt center work. Made from stock components to your specifications.

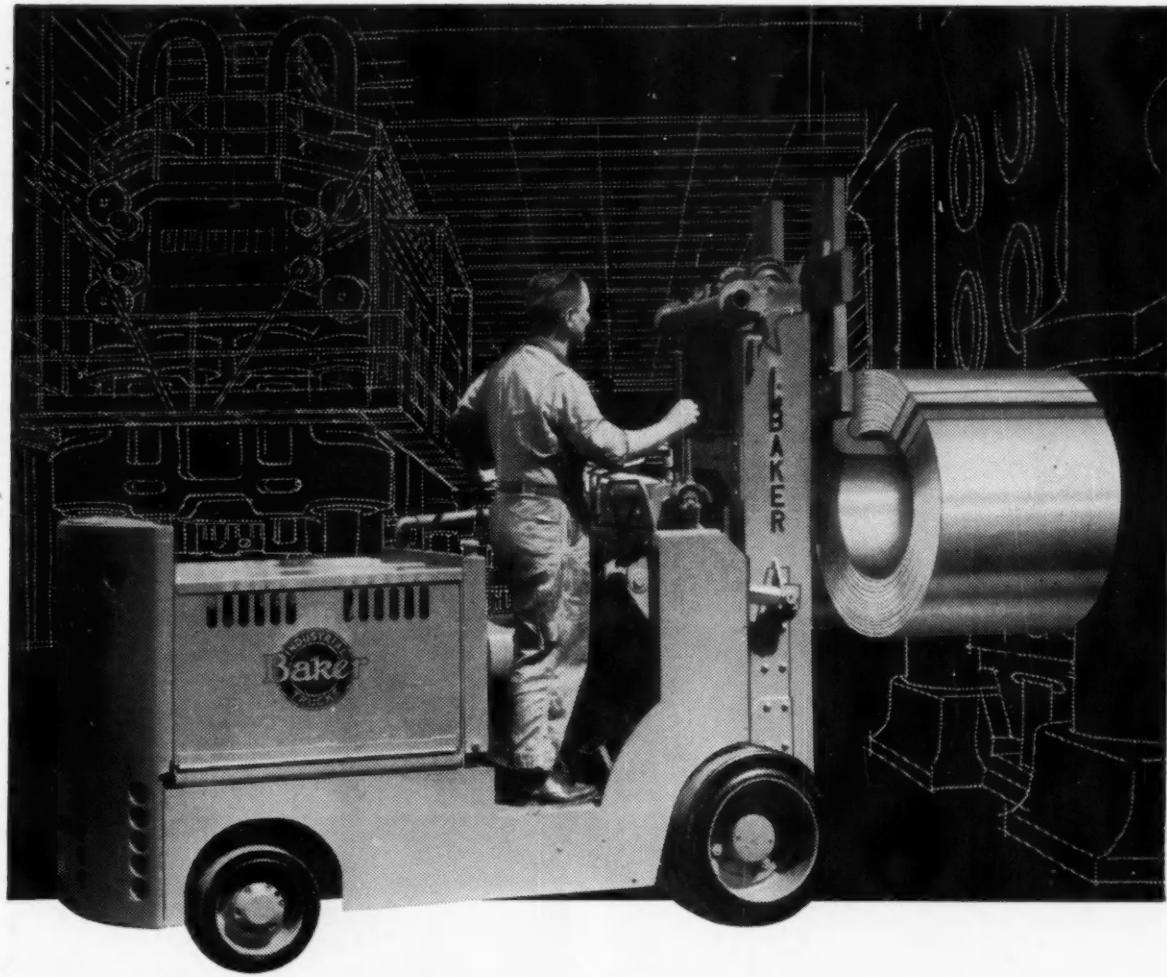


GARDNER - DENVER

KELLER TOOL division, Grand Haven, Michigan

THE QUALITY LEADER IN COMPRESSORS, PUMPS, ROCK DRILLS AND AIR TOOLS
FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY





BAKER "JOM"—a BIG truck for efficient handling of BIG loads up to 10,000 pounds

Here is a rugged, heavy-duty fork or ram truck designed specifically for dependable handling of big, heavy loads. Capacities 7000, 8000 and 10,000 pounds.

Travel motor designed and built by Baker for grueling heavy service has high overload capacity. Five forward and reverse speeds. Fool-proof electric interlock makes it impossible to start in high . . . assures smooth starts, protects motor, truck, and load. Automatic power shut-off and braking provides added safety when operator leaves his position.

Power steering makes the JOM easy to operate,

reduces operator fatigue, means more work. Easily manipulated levers are conveniently located for greatest safety and most efficient operation. Low-cut design of the JOM gives the operator complete all-around vision of the load and road at all times.

Frame is of heavy gauge steel welded into a rigid one-piece assembly. Bumper counterweight is integral part of the frame for extra strength and stability.

Service time and costs are further reduced because all components are easily accessible . . . not hidden or covered by the frame. Write for Bulletin 1328.



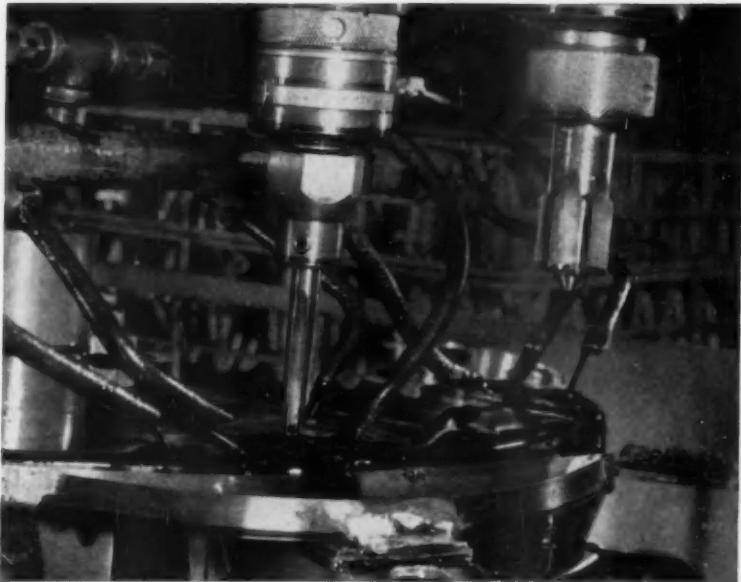
THE BAKER-RAULANG COMPANY
1203 WEST 80th STREET • CLEVELAND 2, OHIO

A Subsidiary of the Otis Elevator Company

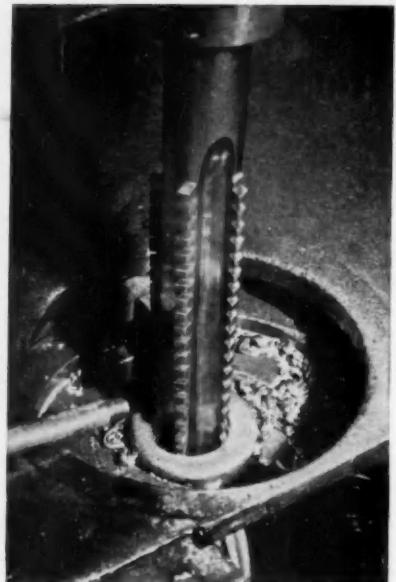


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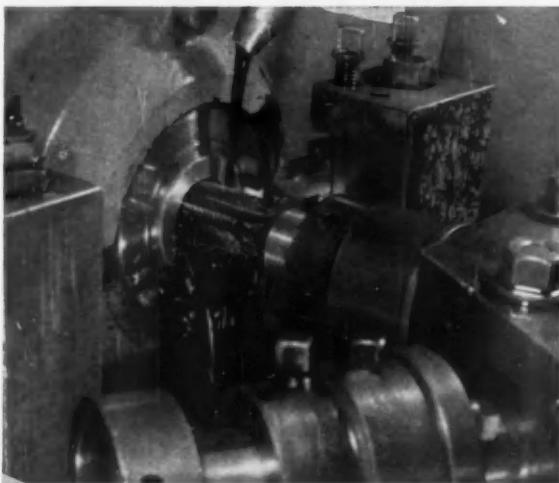
Cutting Tool and Gaging Methods . . . by **BESLY**



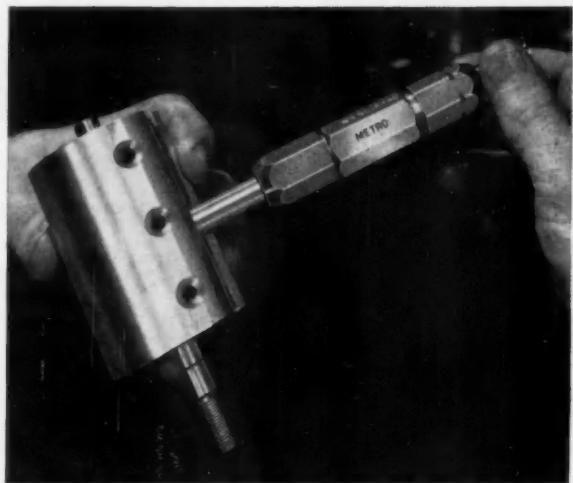
MATCHED TO THE JOB — At The Chicago Screw Company, Bellwood, Illinois, two sizes of Besly taps, poised above an indexing table, are ready to tap C-1141 steel parts. Operating alternately, the smaller $\frac{3}{8}^-24$ Besly tap quickly threads a hole, then the work indexes beneath the $1\frac{1}{2}^-24$ Besly tap and a larger hole is threaded. By using Besly's Engineering Service, this company realized lower costs and a better job. The right taps were carefully selected and matched to the specific threading requirements.



SQUARED OFF — Templeton, Kenly & Company, Broadview, Ill., cuts heavy, almost square threads in malleable iron bases of rugged 12 to 24-ton screw jacks with Besly acme thread form Taps. Notice mirror finish on flutes promoting greater chip clearance.



TOUGH GOING — Here you see a C-1018 high carbon steel nut being threaded by a Besly $1\frac{3}{4}^-24$ tap. Extremely abrasive, because it has been carburized and heat treated, the material is difficult to tap. However, Besly taps tested on the work, proved they could "take it" and were specified by this manufacturer for the job.



ASSURED ACCURACY — To assure that holes in planer cutter head assemblies provide precise fits for set screws, SKIL Corporation, Chicago, checks for accuracy with Besly-Metro Double End Reversible Cylindrical Plug Gages. Two opposed blades have three holding set-screws and another for adjusting position.

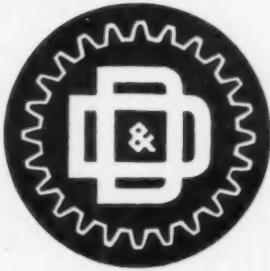
Prove to yourself that Besly Cutting Tools and Gages produce better results. Put them on trial on your toughest jobs, and check the difference in longer tool life, less down time, fewer rejects and faster production. If you'd like to try Besly tools or use Besly's Engineering Service, see your Besly distributor for details, or write us . . .

Engineering, Service and "Specials" . . . are a Besly Specialty

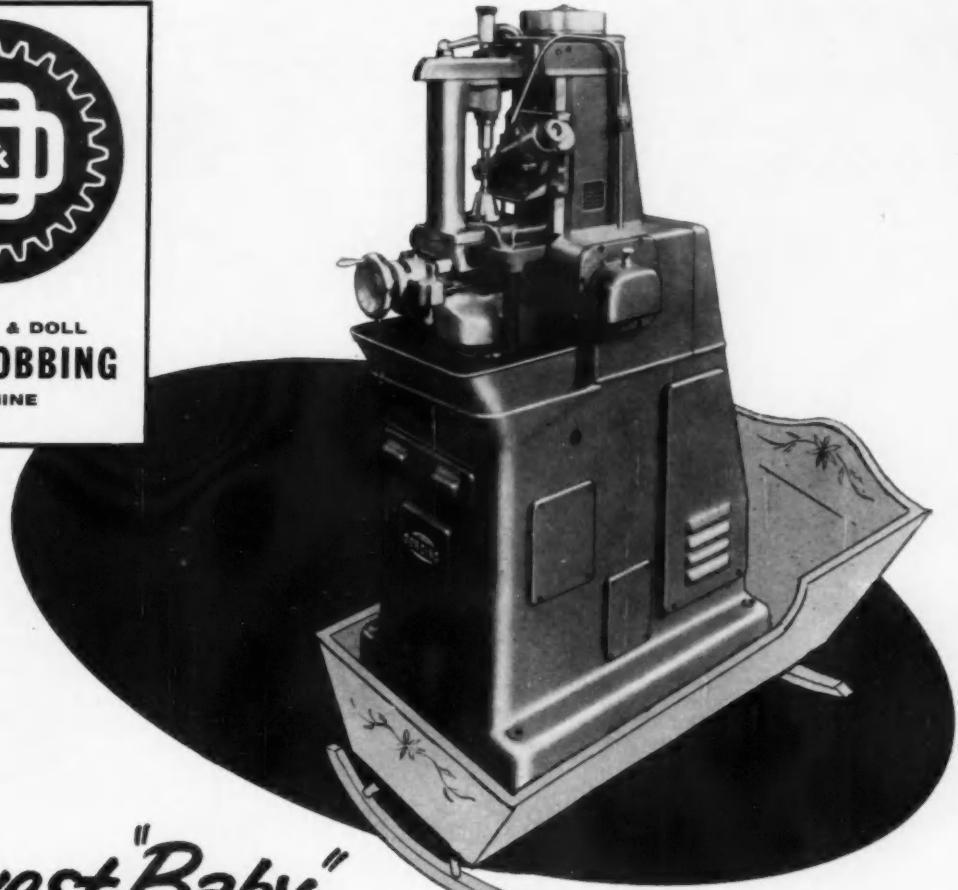


BESLY-WELLES
CORPORATION
Est. as C. H. Besly & Co. 1875
132 Dearborn Avenue
South Beloit, Illinois

TAPS • DRILLS • REAMERS • END MILLS • TOOL BITS • GAGES
CARBIDE TIPPED TOOLS, BLANKS, THROWAWAY INSERTS and HOLDERS



DOWDING & DOLL
GEAR HOBBLING
MACHINE



MEET THE

Newest "Baby"

OF THE **LEES-BRADNER** LINE

SPECIFICATIONS
Model V4

This Dowding & Doll hobber is precision engineered and ruggedly built to turn out small meter, clock or instrument spur, helical and worm gears. Its extreme accuracy results in fine finished gears with perfect pitch and form. Simplicity and versatility are built into this machine.

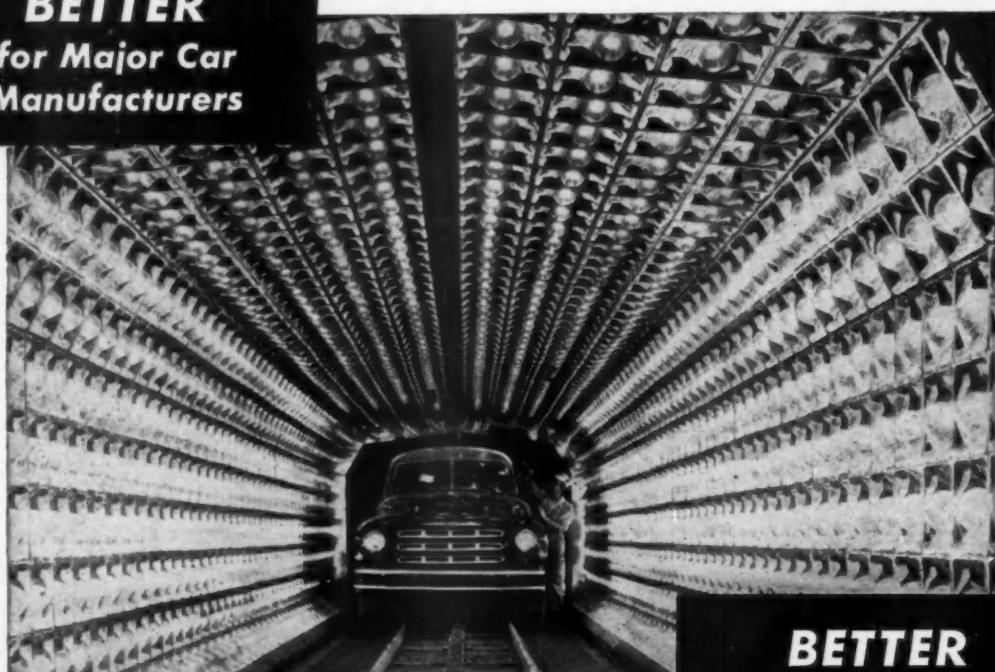
The Dowding & Doll V4 hobber, together with models H7 (max. cap. 8 D. P.) and V8 (max. cap. 14 D. P.), rounds out the complete line of Lees-Bradner made and marketed precision hobbing machines.

Write the Lees-Bradner Co. for full information on these small-sized, accurate hobbers.

Max. pitch in light metals and mild steel	20 D. P. (MOD 1 $\frac{1}{4}$)
Max. pitch in high tensile steel	25 D. P. (MOD 1)
Max. dia. for spur, helical or worm gears	4" (101mm.)
Max. hobbing width for spur gears—up to 2 $\frac{3}{4}$ " dia. (70mm)	3" (75mm.)
over 2 $\frac{3}{4}$ " to 4" dia (70—101mm)	4" (101mm.)
Bore in work spindle	No. 3 M. T
Hob Spindle Speeds	180, 250, 375, 510 r.p.m.

LEES-BRADNER

BETTER
for Major Car
Manufacturers



Fostoria Industrial Infrared Ovens are used by every major car manufacturer in more than 300 automotive installations.

**BETTER
FOR YOU!**

In the automotive industry
MILES OF OVENS . . . BY FOSTORIA
give top-quality results . . . at lowest cost!

Don't take *our* word for it—look what's been happening in the highly competitive automotive industry. Today, the customer list for FOSTORIA RADIANT OVENS reads like a "Who's Who" among automotive manufacturers. The list of FOSTORIA users includes *all* of the major car and truck manufacturers in this country. It also includes many automotive component part manufacturers and assembly plants overseas. These companies are ordering and *re-ordering* FOSTORIA Ovens...and have been for years! The reason behind FOSTORIA's position

of leadership is clear. FOSTORIA is the world's oldest and largest manufacturer of industrial infrared ovens—with unrivalled application "know-how" and experience in engineering *all three major types* of industrial infrared equipment, from components to complete ovens—Quartz Lamp, Radiant Rod and Conventional Infrared Lamp. An experienced FOSTORIA sales engineer is ready to help *you* achieve important savings with FOSTORIA RADIANT OVENS too.

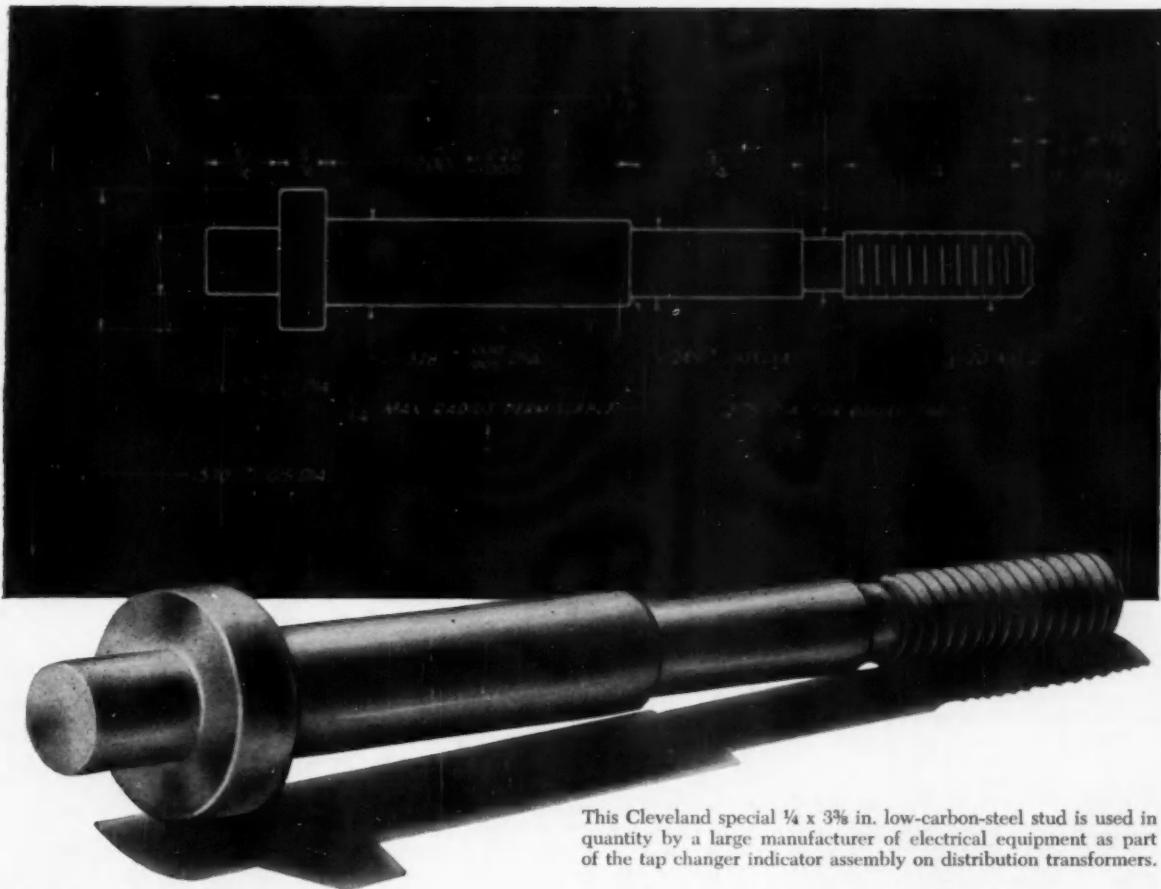
Call him today and take advantage of these specialized services. There's no obligation.

Write for a free copy of
"Applications Unlimited," a fact-filled
booklet of cost-saving information
on Radiant heating.



THE FOSTORIA PRESSED STEEL CORPORATION Dept. 129, Fostoria, Ohio

CLEVELAND SPECIAL HEADED AND THREADED PRODUCTS



This Cleveland special $\frac{1}{4} \times 3\frac{3}{8}$ in. low-carbon-steel stud is used in quantity by a large manufacturer of electrical equipment as part of the tap changer indicator assembly on distribution transformers.

Cost of special collar stud is cut 20% by Cleveland's cold forming techniques

The famous Kaufman Double Extrusion Process which turns out millions of Cleveland precision cap screws yearly is highly adaptable to low-cost production of your fastener-type specials.

The tap changer stud pictured above is typical. Used by a well-known electrical equipment manufacturer, it was previously cut from

bar stock. The special head, double shoulders, and groove above the threads meant numerous machining operations and considerable scrap.

Cleveland now cold forms this special stud at 20% less cost to the customer, while holding the specified .005 in. tolerance. And the part is stronger. In the head, threads and fillets, grain flow is symmetrical and unbroken. In addition, the forging action of the Kaufman process toughens surface metal while

leaving the core ductile. Both fatigue resistance and tensile strength are thus increased.

We are regularly cold forming close-tolerance specials—many with unusual or extreme upsets—in large quantities. So whether your part is simple or complex, it will pay you to check with Cleveland, particularly at the design stage. There is an excellent chance that through cold forming we can cut the cost and improve the physical properties of the part you have in mind.

Write for a copy of our folder "Specials by Specialists"



THE CLEVELAND CAP SCREW COMPANY
4444-10 Lee Road, Cleveland 28, Ohio

Black area represents metal that had to be cut away when stud was produced by machining. In the Cleveland cold forming process almost all the metal in the working slug is present in the finished part. The customer saves the difference.



The **MAGNATEST FW-400 Series** is electronic, eddy current equipment for non-destructive testing of non-magnetic rod, wire, or tube from $1/64"$ to $3"$ diameter. The test is fully automatic and can run at high mill rates (up to 400 and 500 f.p.m.). With the FW-400 such problems as seams, cracks, concentrated porosity, inclusions, stringers, laps, and splits may be detected at the level required. Diameter variation, embrittled areas, and scale are other conditions found with the unit.



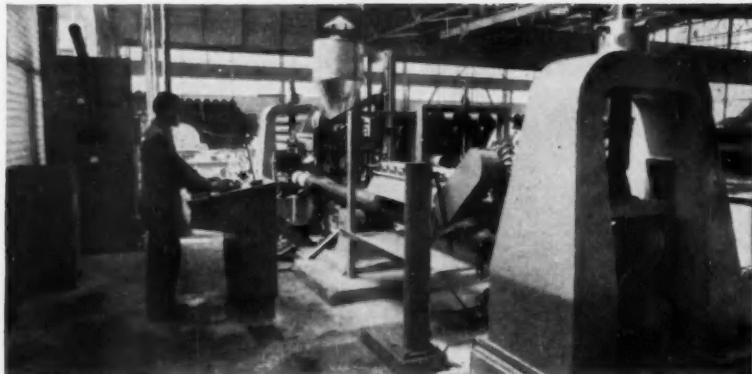
SEMI-AUTOMATIC MAQ 1694 MAGNAFLUX. Unit speeds end inspection for rod mills. A special conveyor extension carries short coil-end samples through a Magnaglo bath. They are then magnetized automatically and pass on to the curtained "black light" booth where defects, if any, show up as glowing indications on the rod ends. The Rate: 15 per minute. This system has cut inspection time in half and has eliminated the need for most acid etching equipment at several mills.

HALLMARK
OF QUALITY IN
NONDESTRUCTIVE
TEST SYSTEMS



Write for complete details concerning any of the above case studies or other tests in mills. Also, ask for our new booklet on "Lower Manufacturing Costs."

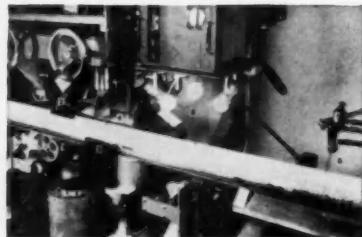
Case Studies: NONDESTRUCTIVE TESTING SYSTEMS



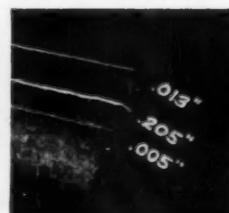
This picture shows the first new fully automatic Magnaflux PYQ equipment used in a steel mill on pipe weld testing. The man operates the mill itself, the Magnaflux unit uses photoelectric inspection.

New Methods Developed for Mill Tonnage Testing

Nondestructive testing has grown from a "sometimes" thing to a full time production tool in many mill operations. New techniques and methods have been developed for every type inspection. Whether the mill produces rods, tubes, rounds, squares, bars or billets, M offers semi or fully automatic inspection systems for practically every need. For instance, the type of defect most commonly found in resistance welded steel line pipe is longitudinal cracks in the weld. As shown in the illustrations above and at the right, such cracks can now be detected automatically right after welding. The crack is spray-marked on the pipe. This is done at production line speeds and without operator optical fatigue factors.



This unit tests pipe welds at rates over 100 ft. per minute. Magnaflux indications of defects are formed at location #4 in photo above. The new SN-100 Series photoelectric scanner automatically "sees" these defects at #5 area. This actuates #6 spring, wherever crack is present — to mark defect with paint.



MAGNAGLO INSPECTION VARIES TO FIND ONLY WHAT YOU WANT TO SEE!

After you decide what constitutes your own serious flaw, Magnaglo can help you achieve consistent quality in production. The magnetizing current and Magnaglo application can be varied and controlled to produce exactly the degree of sensitivity required for your quality standards. The photos above show the same billet inspected under varying techniques and amper-

ages, to suit different billet conditioning needs.

Note: variance of intensity of the Magnaglo indications. You can show or not show any depth seam you require, for each job you run.

Zyglo can be similarly employed on non-magnetic billets, to increase yield and lower conditioning costs.

Take Your Inspection Problems to the House of Answers . . .

MAGNAFLUX CORPORATION

7304 W. Lawrence Avenue • Chicago 31, Illinois
New York 36 • Pittsburgh 36 • Cleveland 15 • Detroit 11 • Dallas 19 • Los Angeles 58

Design "Low Cost" Into YOUR Equipment

GITS

World's Largest Selection of Low-Cost Lubricating Devices

CLIPS FOR ATTACHING TUBING

When ordering, specify $\frac{1}{4}$ ", $\frac{3}{8}$ " or $\frac{1}{2}$ " tubes.

Style TF.



Single Clips



Double Clips



3-Tube Clips



4-Tube Clips



Double Clips - Wing Type

SIGHT GRAVITY FEED OILERS

Rate of oil flow regulated by needle valve, directly observed through sight glass in stem.

Shut-off knob does not affect needle valve adjustment. Visible oil supply. Non-breakable. Tops in convenience and dependability, at low cost. Style NFU—No. 3602-A.



GEAR CASE GAUGES

This oil gauge plug permits instant checking of oil level within a transmission or gear case. For use where construction permits insertion in tapped hole. A valuable addition to any such equipment—at very low cost. Style BW—No. 4042.

SIGHT GRAVITY FEED MULTIPLE OILERS



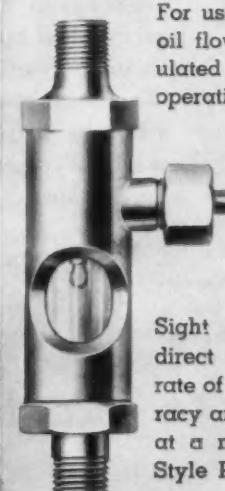
This one unit replaces 3 to 8 individual oilers. Maximum practicality in a small central lubrication system. Positive cut-off during idle periods. Individual vibration-proof needle valve adjustments. With solenoid control (Illustrated): Style MDS—No. 4685-A. Without solenoid: Style MD.

SIGHT GAUGES

For use where rate of oil flow must be regulated to suit changing operating conditions.

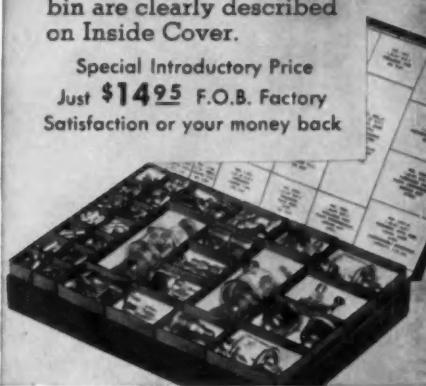
Needle valve permits extremely accurate adjustment of oil feed.

Sight glass provides direct observation of rate of oil flow. Accuracy and convenience at a moderate price. Style PF—No. 4290.



LUBRIKIT . . . An assortment of 95 oil cups of 29 different types. Gits sales records show these oilers are most used for replacement and maintenance. Contents of each separate bin are clearly described on Inside Cover.

Special Introductory Price
Just \$14.95 F.O.B. Factory
Satisfaction or your money back



Don't price yourself out of the market. When you design proper lubrication into your equipment, specify GITS Lubricating Devices—the widest selection available anywhere. The items pictured above are only a few of our many thousands of lubricating devices. At the design stage, get the GITS story. Free Engineering Service. Send NOW for your free Catalog.

GITS BROS. MFG. CO.

The Standard For Industry For Almost Half A Century

1870 South Kildare Avenue
Chicago 23, Illinois

Clip this page for handy "rough reference"

MALLORY



Completely new design concept eliminates usual button contact, provides larger contacting area. New units have far longer life, lowest noise level yet . . . but cost no more.

Vibrator life increased 50 to 100% . . . in newest Mallory design

STANDARDS of vibrator performance never before possible are being set by the latest development in Mallory vibrator engineering. Through the use of new design and materials, contact is made directly between vibrating reed arm and side arm—eliminating conventional contact buttons—providing far greater contacting area and longer life.

And in addition, a further refinement in the mounting of the vibrator establishes a new high standard of quieter operation.

The results of these new design concepts are important to everyone who designs, makes or uses vibrator-powered equipment.

Life is increased 50 to 100% . . . due to greater contacting area and far lower rate of wear.

Sticking of contacts is eliminated.

Serving Industry with These Products:

Electromechanical—Resistors • Switches • Television Tuners • Vibrators

Electrochemical—Capacitors • Rectifiers • Mercury Batteries

Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials

Parts distributors in all major cities stock Mallory standard components for your convenience.

Complete uniformity of characteristics is made possible by this simplified design, which permits automatic production and adjustment techniques.

Extra-quiet operation. Mechanical hum is held to a new low level, due to the lighter mass of the mechanism, and to noise-squelching Mallory refinements.

Smaller size for equivalent load rating.

The new Mallory 1600 series vibrator is now available for auto radios, headlight dimmers, garage door openers and many other applications. In addition, the new leaf spring contacting concept is available in another new Mallory vibrator—the 1700 series for two-way communications equipment and other heavy duty applications.

Expect more . . . Get more from

MALLORY P. R. MALLORY & CO. Inc.

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

This is the nineteenth of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

Determining the Proper Depth of Case in Alloy Steels

In the previous article of this series we discussed the carburizing of alloy steels, pointing out that the purpose of carburizing is to provide a hard, abrasion-resistant outer shell or "case." Such a discussion naturally gives rise to the question, What factors influence the choice of case? Should it be shallow? Medium? Deep or extra-deep?

While it is not always wise to formulate hard-and-fast rules, the following may be used as a general yardstick:

Shallow cases (less than 0.02 in.). Suitable where wear-resistance alone is the chief requirement, and where good surface condition after heat-treating is advantageous. Not suitable if high stresses are apt to be encountered in service.

Medium cases (0.02 to 0.04 in.). For high wear-resistance. Will stand up under substantial service loads and stresses. The thickness is sufficient to permit certain finishing operations, such as light grinding.

Medium-to-deep cases (0.04 to 0.06 in.). For high wear-resistance. A case in this depth range is essential where continuing friction is involved, especially friction of an abrasive or semi-abrasive nature. It is also a good precautionary measure where application of the finished part may sometimes involve crushing action.

Extra-deep cases (more than 0.06 in.). Cases of this depth can be obtained by extending the furnace time in pack carburizing. Highly wear-resistant, they also withstand shock and impact. A large camshaft of an internal-combustion engine is a good example of a part requiring the extra-deep case. This is of course particularly true of the cam lobes themselves.

If you require specific advice concerning case-hardened parts, by all means communicate with our Metallurgical Division. Bethlehem technicians are always on call, and you can depend on their recommendations. And you can depend on Bethlehem, too, when seeking new supplies of alloy steels; for Bethlehem makes the full range of AISI standard grades, as well as special-analysis steels and all carbon grades.

If you would like reprints of this series of advertisements from No. I through No. XVI please write to us, addressing your request to Publications Dept., Bethlehem Steel Company, Bethlehem, Pa. The first 16 subjects in the series are now available in a handy 32-page booklet, and we shall be glad to send you a free copy.

BETHLEHEM STEEL COMPANY

BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation



BETHLEHEM STEEL

There's a dependable

Bendix ^{AN}
SCINFLEX CONNECTOR

for every electrical circuit

These electrical connectors are designed and built to provide maximum performance under the most rugged operating conditions.

Well recognized for outstanding characteristics of resistance to moisture and vibration, these connectors are provided in a variety of AN types.

Our Sales Department will be glad to furnish complete information on request.

*Trademark

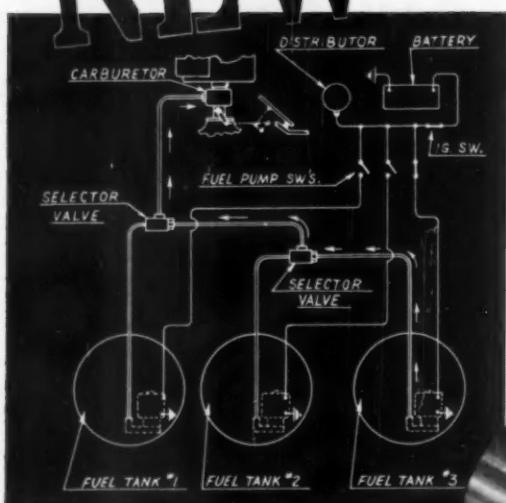
Bendix SCINTILLA DIVISION OF **Bendix**
SIDNEY, NEW YORK AVIATION CORPORATION

Export Sales and Service: Bendix International Division, 205 East 42nd St., New York 17, N.Y.
FACTORY BRANCH OFFICES:
1117 E. Providencia Avenue, Burbank, California • 512 West Avenue, Jenkintown, Pennsylvania • Stephenson Building, 6560 Cass Avenue, Detroit 2, Michigan • 5906 North Port Washington Road, Milwaukee 17, Wisconsin • American Building, 4 S. Main Street, Dayton 2, Ohio • 8401 Cedar Springs Road, Dallas 19, Texas • Boeing Field, Seattle 8, Washington • 1701 "K" Street, N.W., Washington 6, D.C.



NEW...

An Automatic Selector Valve
that you should know about!



Diagram, above, shows typical three tank set up. Fuel is being drawn from tank No. 3. Selector valves have sealed off other two tanks but will permit fuel flow when fuel pump switches are closed.

New Products Automatic Selector valve about $\frac{1}{2}$ size. A new folder is available showing inside design and illustrating the method of operation.



PAT. PEND.

If you are using the advanced method of distributing fuel to your truck engines with pumps in the tank you should ask for full details on the New Products Automatic Selector Valve.

The automatic Selector Valve frees the operator from watching fuel gauges. He can throw a full tank into the system at any time before the low point is reached. Both tanks will operate until the first tank is empty when the second tank takes over, and the first tank can be shut off at the operator's leisure.

The Automatic Selector Valve is thoroughly tested and approved. It is simple, small, compact. It is easy to install. It will direct the flow from any or all tanks at the same time and it will handle any fluid or gas.

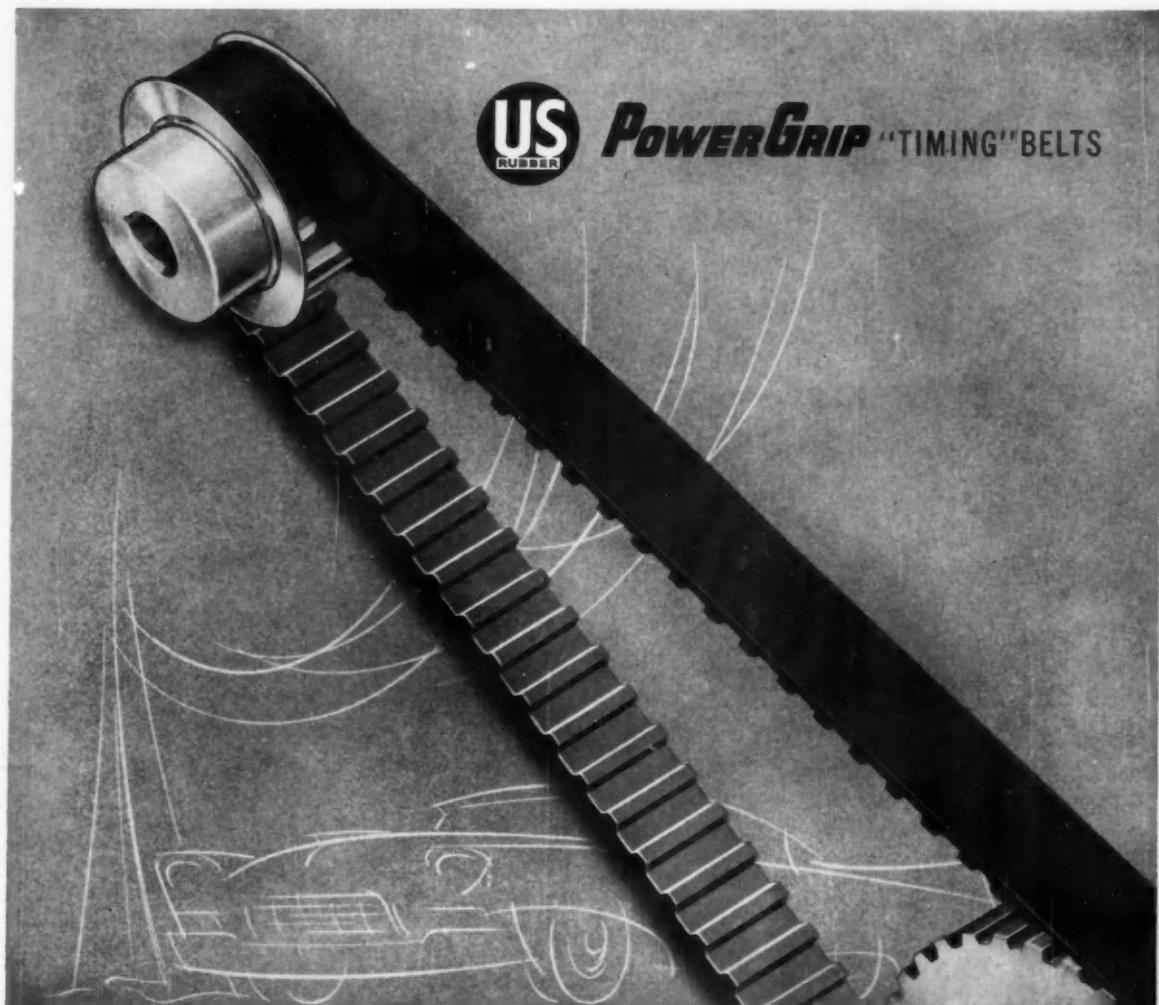
If you are a manufacturer of automotive equipment this valve will materially improve your fuel system. If you are a fleet operator it will be a boon to your drivers. Valves can be supplied to meet customers' requirements.

Ask for our new folder and let us discuss your problem with you.

**NEW PRODUCTS
CORPORATION**

3636 Oakton Street
Skokie, Illinois

Phone: ORchard 3-5873



POWERGRIP™ "TIMING" BELTS

**U. S. PowerGrip "Timing" Belts
offer the automotive designer
all these advantages:**

- no slippage, no take-up—allows long or short centers, high ratios.
- absence of metal-to-metal contact eliminates need for lubrication and housing devices.
- handles speeds up to 16,000 F.P.M., or so slow as to be imperceptible to the eye.
- close to 100% efficiency in positive power transmission.
- constant angular velocity.
- noiseless operation.
- imbedded with steel cables to provide high tensile strength.

Just a few of the many automotive applications where U. S. PowerGrip® "Timing" Belts will improve on conventional power transmission drives are: camshaft drives • window regulators • governors • generators • power steering • air conditioning.

• • •
"U. S." also provides the automotive industry with a comprehensive line of molded and engineered rubber products, hose and adhesives.

With U. S. Engineered Rubber Products, designers find they can do things impossible with other material. That's because "U. S." expertly molds rubber with any or all of these important properties: compression recovery • resistance to acid, various chemicals, oil, water • hot or cold tear resistance • required tensile strength and elongations.

"U. S." factory-trained engineers and power transmission experts are ready to serve you. Simply contact U. S. Rubber, Automotive Sales, Mechanical Goods Div., New Center Bldg., Detroit 2, Michigan. Phone: TRinity 4-3500.



Mechanical Goods Division

United States Rubber

*Oldest in age
Still in
the lead*

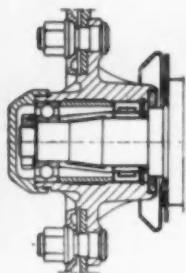
loose needles



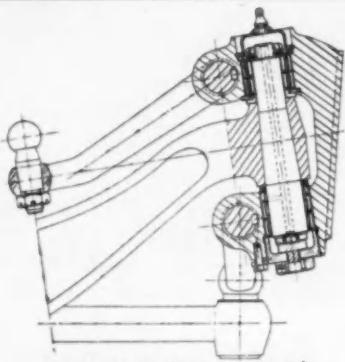
needle cartridges



complete bearings



WHEEL HUB



KING PIN (FRONT AXLE)



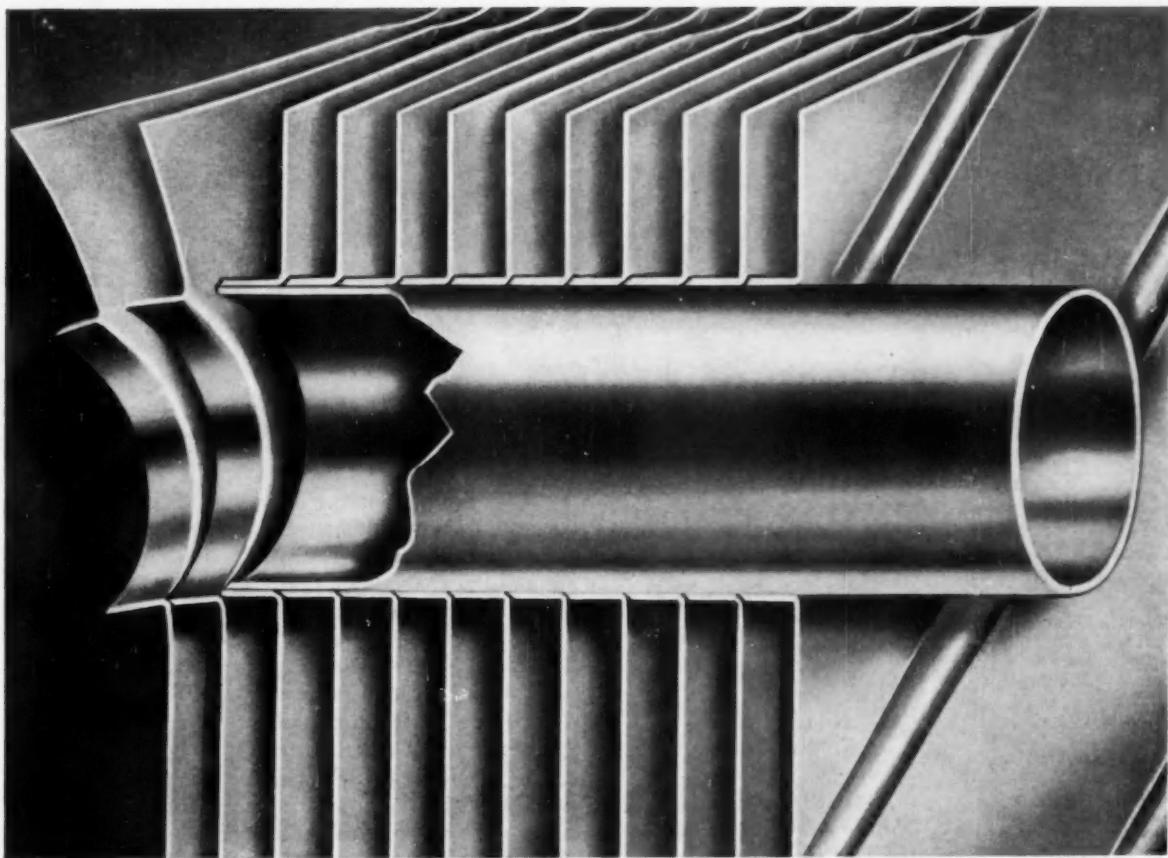
CONNECTING ROD



NADELLA
NEEDLE BEARINGS

ACTA

133 à 137 BOUL. NATIONAL - RUEIL-MALMAISON (S.-&-O.) FRANCE



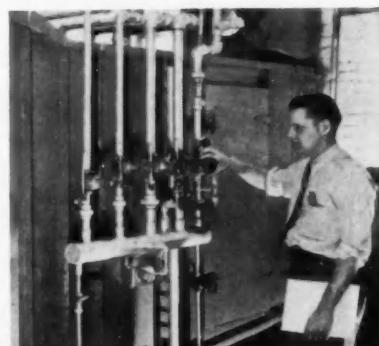
Close up . . . or on the job . . .

You'll See SAVINGS with Westinghouse Heating Coils

Westinghouse continuous plate-fin surface heating coils mean ease of installation, high performance with maximum operating economy, and long life on the job . . . plus these extra advantages:

- Low air resistance produces greater heat transfer at lower fan HP demands.
- Choice of fin materials . . . aluminum or copper, continuous plate-fins.
- Available in eighteen sizes, seven fin widths and three fin types to meet all your needs!
- *Permanent Mechanical Bond*: tubes are heat expanded into plate fin collars, forming a permanent bond for maximum heat flow from primary to secondary surface . . . provides greater efficiency!
- Available in heavy duty wrought iron piping with helical steel fins . . . for continuous duty high pressure systems and industrial process work . . . a Westinghouse exclusive!

Call your Sturtevant Division Sales Engineer for complete details for your heating coil requirements, or write Westinghouse Electric Corporation, Dept. 14A, Hyde Park, Boston 36, Massachusetts.



Laboratory test of Westinghouse heating coils helps assure long heating life at rated performance.

WESTINGHOUSE AIR HANDLING

YOU CAN BE SURE...IF IT'S **Westinghouse**

J-80596



BRUSHING METHODS *worthy of your confidence*

Start of a flawless finish

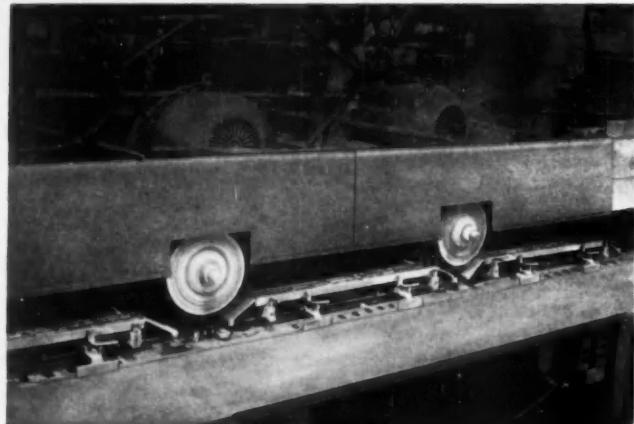


*A leading manufacturer of
trim parts uses 16" diameter
Osborn Fascat[®] Brushes,
operating at 1700 rpm, to produce
perfect plating surfaces.*

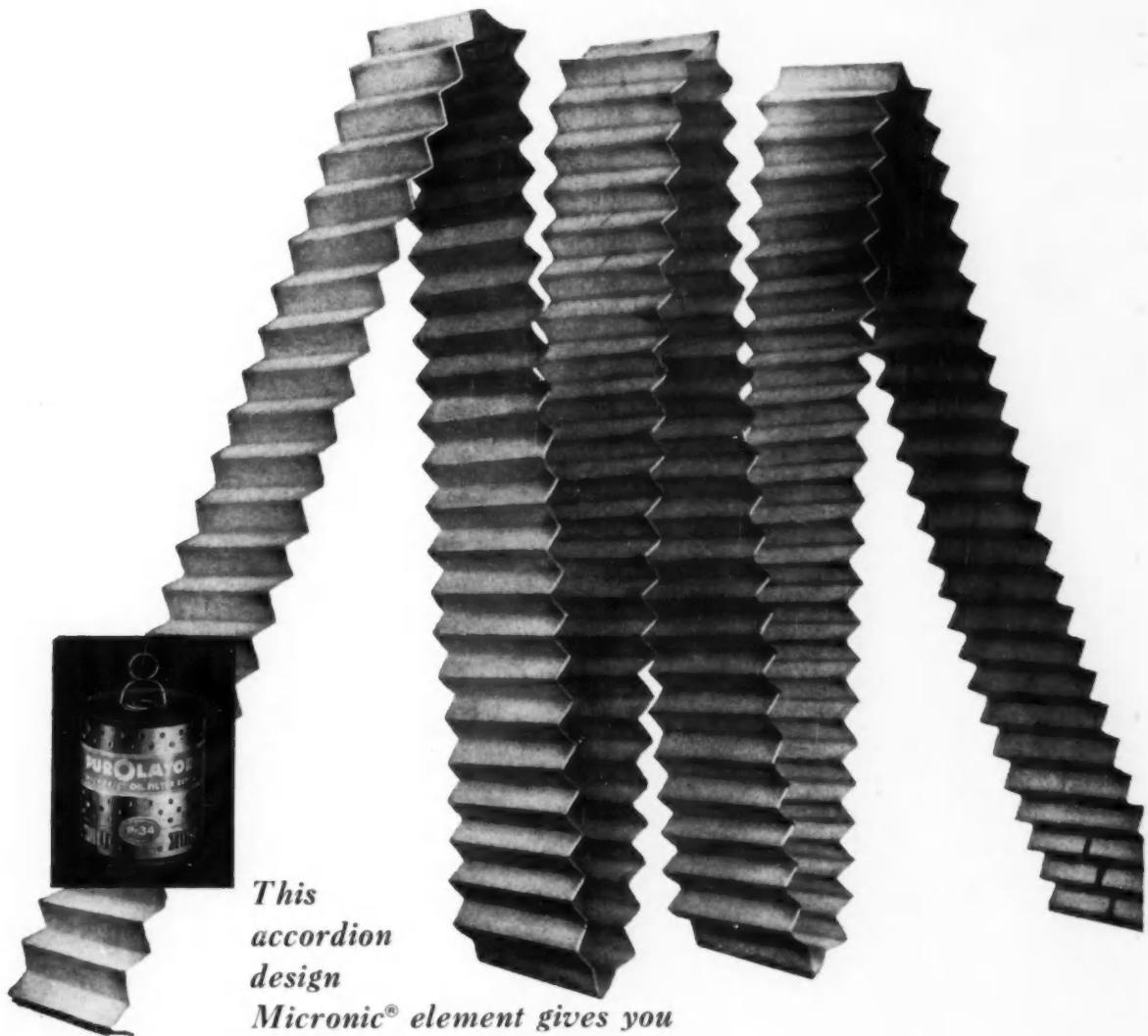
THE bright finish on trim parts that "dress up" thousands of products must start with a perfect, unmarred surface prior to final buffing and plating.

Osborn power-brushing has proven the ideal production method for removing draw marks, blending imperfections as an essential preliminary step, before buffing.

These outstanding results are another reason why Osborn power brushing has gained industry's confidence. An **Osborn Brushing Analysis**, made at no obligation, will show how you can benefit from this advanced finishing method. Write *The Osborn Manufacturing Company, Dept. E-48, 5401 Hamilton Avenue, Cleveland 14, Ohio.*



Osborn Brushes



*This
accordion
design
Micronic® element gives you*

10 times more filtration area for full engine protection

Pull out Purolator's accordion design and you'll see how Purolator packs 10 times more filtration area into its element than most filters. You'll find it provides maximum filtering area in minimum space, assuring *full* engine protection as no other filter does.

Controlled porosity of Purolator's Micronic® element filters out particles as small as .000039 of an inch, yet never removes costly additives in heavy-duty or detergent oils and never channels. The Micronic® element, made of plastic-impregnated cellulose, isn't affected by engine temperature, crankcase dilution, or water.

Engine manufacturers have proved time and time again that these wear-reducing features make an engine perform better and last longer. Find out how they can

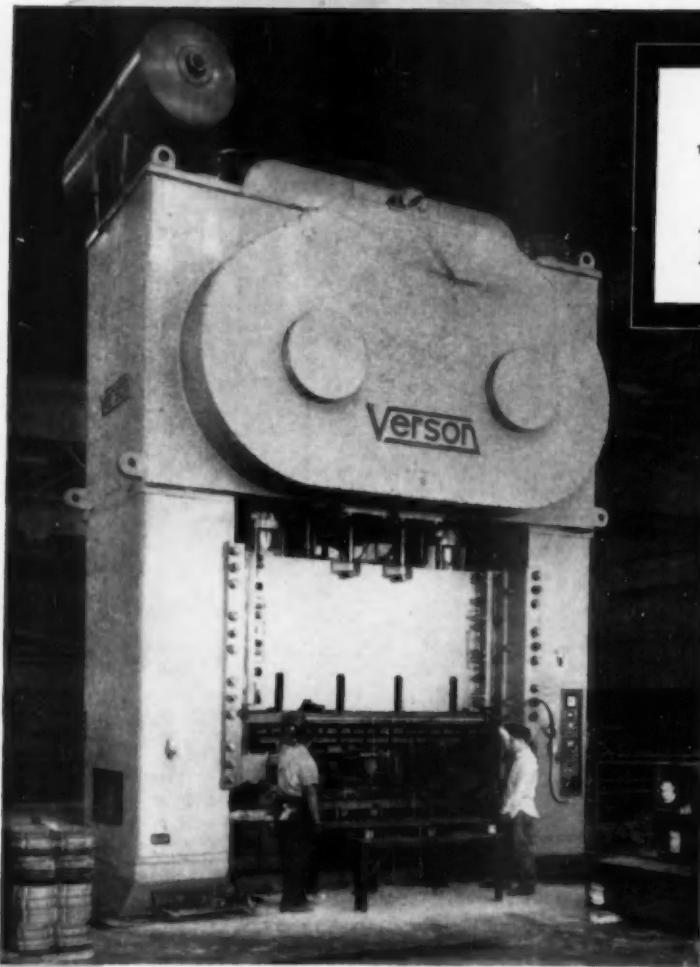
do the same job for you. Write for our new 32-page "Filtration Manual for Product Designers"—and please enclose 25¢ to cover postage and handling. Address Dept. A4-116.

Filtration For Every Known Fluid

PUR-O-LATOR
PRODUCTS, INC.

Rahway, New Jersey and Toronto, Ontario, Canada

Front to Back Crank Arrangement of this



TRADE **Verson** MARK
1800 Ton Press

eliminates
need
for
extra long
shaft

Verson Presses offer features that bring accuracy, dependability and economy to a wide range of metal forming operations. The Verson Allsteel Frame, anti-overlap clutch and brake unit, square type gibs and non-oscillating vertical type adjusting screw are examples of the engineering and design that are a part of every Verson Press.

The press illustrated is a Verson 1800 Ton, twin gear, double crank. Two crankshafts are arranged front to back to eliminate the necessity of an extra

long crankshaft. Gearing for the press can be installed and removed through the front of the crown allowing installation in areas with low overhead clearance. The machine was built to J.I.C. standards and has all electrical wiring and equipment, lubrication piping, air piping and controls installed internally.

We will be pleased to recommend Verson Presses to fit your production process. Just send an outline of your requirements.

A Verson Press for every job from 60 tons up.

TRADE **Verson** MARK

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

VERSON ALLSTEEL PRESS CO.

9307 S. KENWOOD AVENUE, CHICAGO 19, ILLINOIS • 8300 S. CENTRAL EXPRESSWAY, DALLAS, TEXAS

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES



...new yardstick for measuring profits!

Towmotor Mass-Handling—moving more units faster, at lower cost—can well be the investment that promises greatest improvement in your future profits, as you face continually rising costs and a shrinking manpower pool.

Integrating Towmotor lift trucks in your departmental operations lets you *supplement* your personnel without adding to your payroll. Enables your men to do a bigger day's work *easier*. Sends them home *fresher*. Permits each one to handle jobs you'd pay a *crew* to do!

Have you seen the new Towmotor lift trucks lately? They offer a wealth of "first-time" features such as:

- Fatigue-free adjustable seating
- Motion-saving "centralized control"
- Maximum free lift that tops all

- No-loss hydraulic lifting action
- Power steering that saves 80% of operator's efforts

Get Bulletin SP-23 on new Towmotor lift trucks from Towmotor Corporation, Cleveland 10, Ohio.

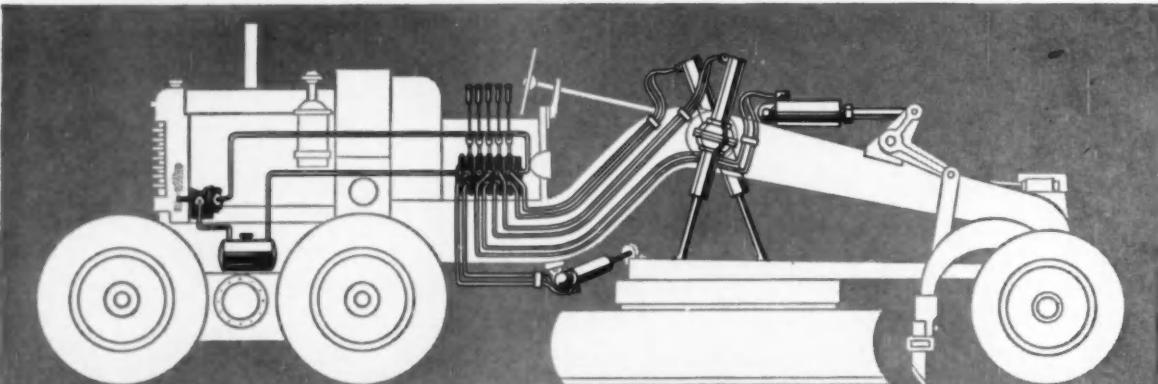
**Leaders for 38 years in
building Fork Lift Trucks,
Tractors and Carriers**

TOWMOTOR THE ONE-MAN-GANG -GERLINGER

Gerlinger Carrier Company, Dallas, Oregon, is a subsidiary of Towmotor Corporation, Cleveland 10, Ohio

5 BIG REASONS

SUPERIOR SAE HYDRAULIC TUBING PRACTICALLY ELIMINATES TUBING FAILURE



Greatly improves performance of materials handling units, machine tools, instrument lines, construction and lubricating equipment, agricultural implements, and hydraulic valves as instrumentation lines.

- 0.12% maximum carbon content for high ductility—permits easy hand bending and flaring
- Use of non-aging steel prevents loss of ductility and impact resistance
- Hydrostatic tested at maximum working pressures
- Clean and smooth inside and outside surfaces minimize pressure drop
- Available from warehouse stocks

This motor grader is one of the many types of mechanized equipment that use Superior SAE Hydraulic Low Carbon Steel Tubing.

Superior SAE Hydraulic Low Carbon Steel Tubing is made from a carefully controlled non-aging type of steel which will not harden in storage or use. Aging and precipitation hardening are changes in properties that some steels undergo at atmospheric or moderately elevated temperatures after cooling or cold working. These take place even where steel is stored at room temperature, though at a slower rate.

Superior SAE Tubing, whether in storage or operation,

will maintain the yield strength, elongation and ductility it has when shipped from the mill.

Superior SAE Hydraulic Tubing is available from distributor warehouse stocks or mill produced to your order in long coils.

Send for a copy of Bulletin 39, containing detailed information on the uses and advantages of Superior SAE Hydraulic Tubing. Write Superior Tube Company, 2011 Germantown Ave., Norristown, Pa.

Superior Tube

The big name in small tubing
NORRISTOWN, PA.

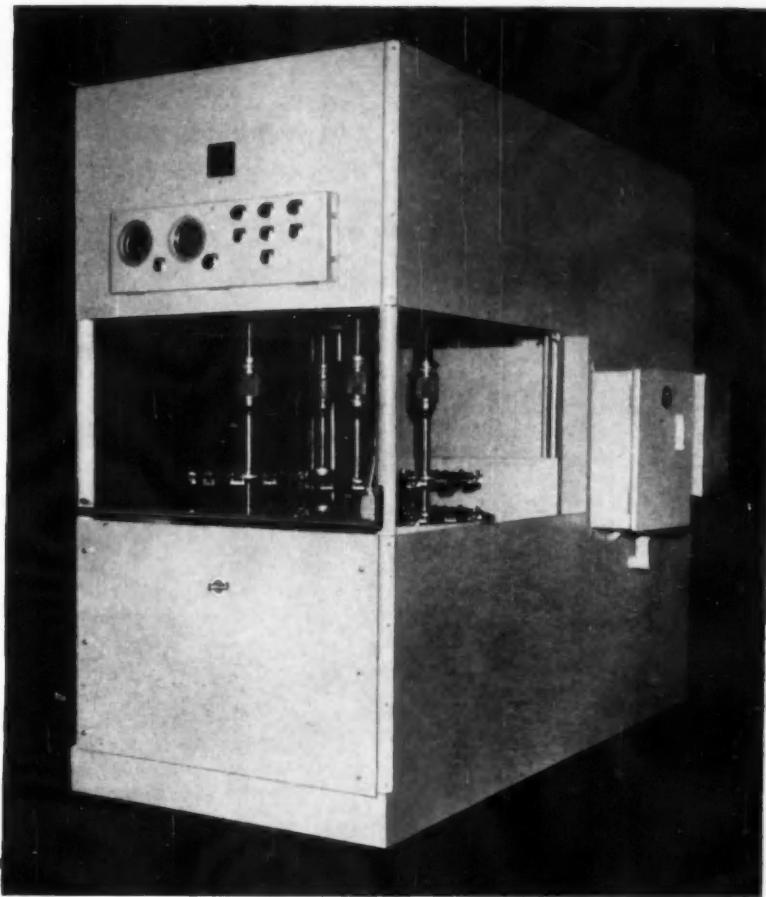
All analyses .010" to 5/8" OD—Certain analyses in light walls up to 2 1/4" OD

On the West Coast: Pacific Tube Company, 5710 Smithway St., Los Angeles 22, Calif.

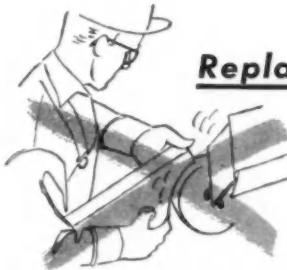


OFFERS

Spin-Finish



AN ENTIRELY NEW PARTS-FINISHING PROCESS



Replaces hand and automatic buffing!

Sets New Standards In Pre-Plating Finishing Costs

Wipe the slate clean of all present concepts of speed, efficiency and costs in pre-plating finishing of brass, zinc-base and aluminum die-cast parts! In one short, automatically-timed operation—and on a *multiple mounting* of parts—new SPIN-FINISH produces surfaces and lustre equal to or surpassing that of buffing.

Savings on time, labor and plant space are tremendous! Eliminated are vast exhaust and ventilating systems! You'll want to learn all about this startling revolutionary method of finishing. Write for complete information now.

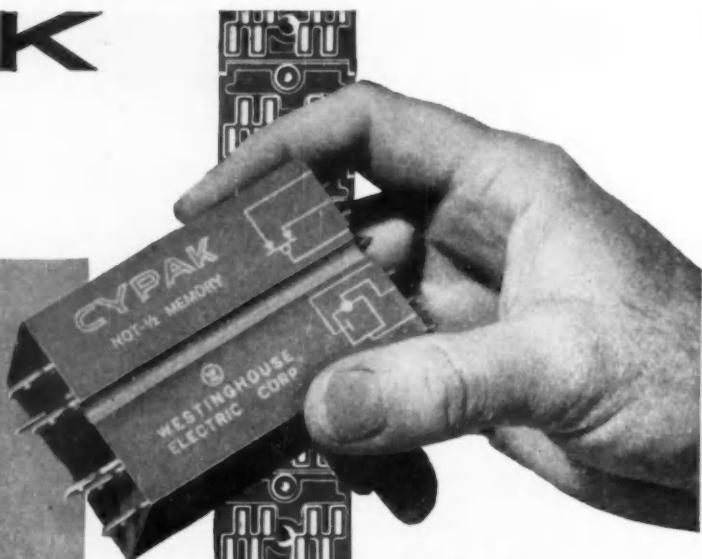
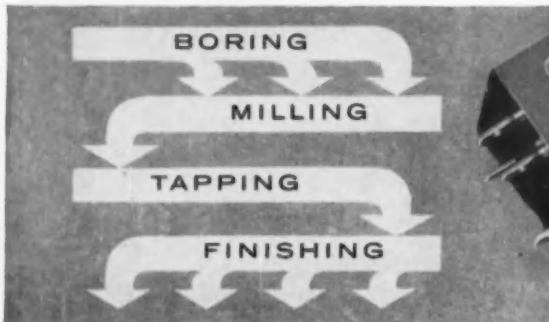
- One-operation finishing, even of the most complex parts
- Completely dry process... no lubricants needed
- Dust and fume free... no need for exhaust or ventilating systems
- No set-up time required for changing jobs

GRAV-I-FLO CORPORATION

Dept. AI 1, 400 Norwood Avenue, Sturgis, Michigan

CYPAK

AT WORK...



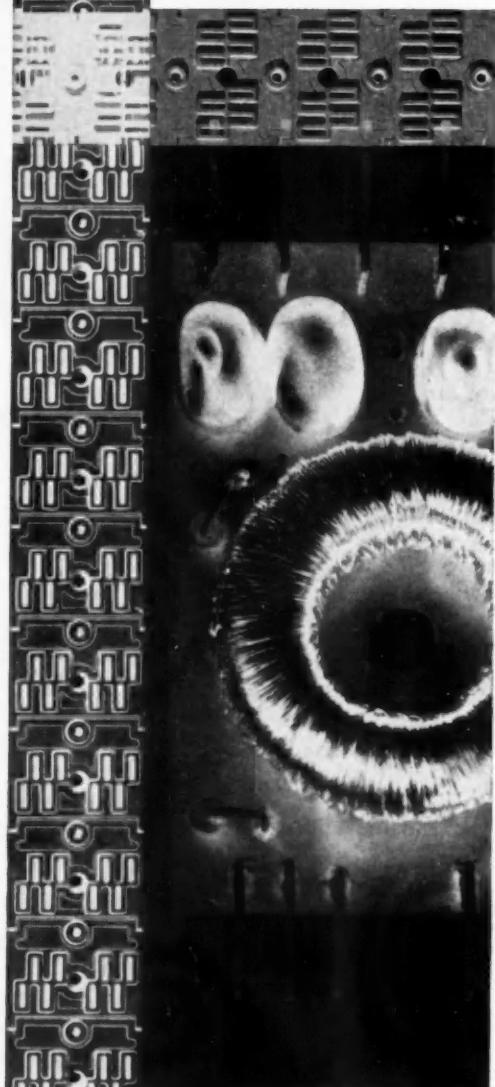
simplifies automatic control of transfer machines

When you're considering the cost of transfer-type machining operations, look at the new areas of return from the simplicity of CYPAK* control systems. Transfer machine installations of CYPAK are proving two important facts.

First, CYPAK has made the first major change in simplifying industrial control reliability. The control elements have no moving parts to wear, corrode or jam. Conservatively rated, CYPAK life is many times longer than conventional relay systems. You can measure the savings in more continuous production . . . control replacement costs eliminated.

And second, CYPAK design greatly improves the physical simplicity . . . ease of inspection, addition, or change of transfer machine control. Each CYPAK element is encased in a protective plastic block. These are plugged-in—locked-in to a common power channel forming a compact, simply wired system.

We'd like to give you further proof of CYPAK contributions to complex machine control. Your Westinghouse sales engineer has full reports on many different applications. Call him today or write Westinghouse Electric Corporation, Dept. B, 3 Gateway Center, P.O. Box 868, Pittsburgh 30, Pa. *Trade-Mark
J-21964

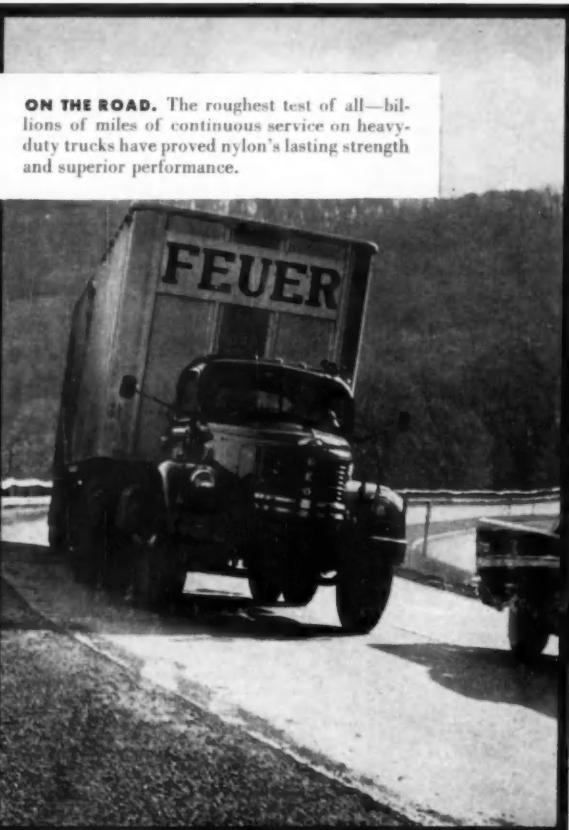


WATCH WESTINGHOUSE!

WHERE BIG THINGS ARE HAPPENING TODAY!



IN THE LABORATORY. When this photo was taken, the impact cleat had smashed into the nylon cord tire more than 300,000 times. Ordinary tires will stand only one-fifth as many blows.



ON THE ROAD. The roughest test of all—billions of miles of continuous service on heavy-duty trucks have proved nylon's lasting strength and superior performance.

TEST AFTER TEST PROVES NYLON TIRE CORD GIVES EXTRA STRENGTH FOR EXTRA SAFETY



Powerful advertising campaign will appear throughout the year in these influential magazines. This series of Du Pont nylon cord tire ads tells customers of nylon's lasting ability to shrug off the abuse of "just-around-town" driving and thus offer utmost safety on the highway.

Today's heavier, more powerful cars and sustained-speed superhighway driving put added strains on tires, mile after mile. That's why motorists need tires with the lasting strength and safety of nylon cord.

Nylon cord tires reduce unsprung weight, and nylon's shock-absorbing toughness can take the added strains of power steering, braking and higher horsepowers. Nylon cord resists unseen bruise damage that can often seriously weaken a tire and lead to blowout. In fact, nylon cord gives added protection against *all* four major causes of blowout: heat, moisture, flex fatigue and bruise damage.

Surveys and rising sales both show that today's motorists know and want the extra strength and extra safety of nylon cord tires.

Du Pont produces the nylon fiber.
All tire manufacturers make nylon cord tires.

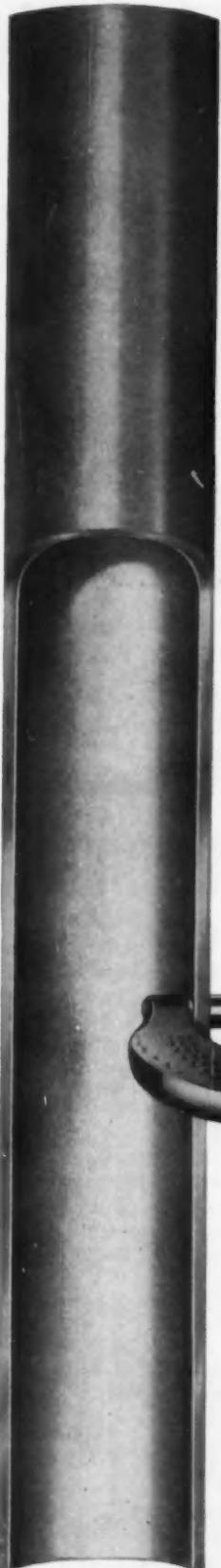


BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

Today, the strongest, safest tires are made with nylon cord

CYLINDER TUBING

... "mirror-finished" by Standard



Standard "mirror-finished" cylinder tubing is full-finished to use without further sizing or finishing for such applications as *automobile shock absorbers, power steering and hydraulic pumps*. When it comes to punishment, it can really take it. Every inch of this rugged tubing measures up to exacting specifications in cylinder finish . . . in ID tolerances as close as .001" . . . in extreme uniformity of wall thickness and concentricity . . . in internal pressure resistance, *tested to shocks up to 9000 p.s.i.* Cylinder sizes to 3" OD x .165" wall. For full information on Standard's complete range of products, plant facilities and engineering assistance send for *free* folder below.

- Welded Stainless Tubing and Pipe.
- Welded Carbon Steel mechanical.
- Special Shapes
- Boiler and Heat Exchanger.
- Exclusive rigidized patterns.



Shock absorber with metal-to-metal plunger in cylinder tube held to .001" ID tolerance. "Mirror-finish", concentricity and precision tolerance makes Standard cylinder-grade tubing usable *as is* for hydraulic and other cylinders.



Free 8-page folder on
all Standard products.
Write to address below.

STANDARD

THE STANDARD TUBE COMPANY
24400 PLYMOUTH ROAD • DETROIT 39, MICHIGAN

Welded stainless tubing and pipe • Welded carbon steel mechanical • Boiler and Heat Exchanger
• Exclusive rigidized patterns • Special Shapes • Steel Tubing—Sizes: $\frac{1}{2}''$ OD to $5\frac{1}{2}''$ OD
—.028 to .260 wall • Stainless—Sizes: $\frac{1}{4}''$ OD to 4" OD—.020 to .154 wall.



**The Oakite CrysCoat
Cleaning-Phosphating Process
makes paint finishes more durable*

THE J. W. REX COMPANY, Lansdale, Pa. uses Oakite CrysCoat SW in their 5-stage washer to prepare for painting this one-piece 8 lb. zinc die cast bezel front.

Oakite CrysCoat SW puts a heavy phosphate coating on the surface of this new 21" TV set. This coating provides a perfect foundation for long-lasting adhesion of the gold lacquer finish. Prevents under-coat corrosion.

J. W. Rex reports that after 18,000 of these new 21" TV fronts travelled through their continuous painting line reject rate—with 100% inspection—ran only seven tenths of 1%.

There is a CrysCoat Process to suit your particular product and equipment:

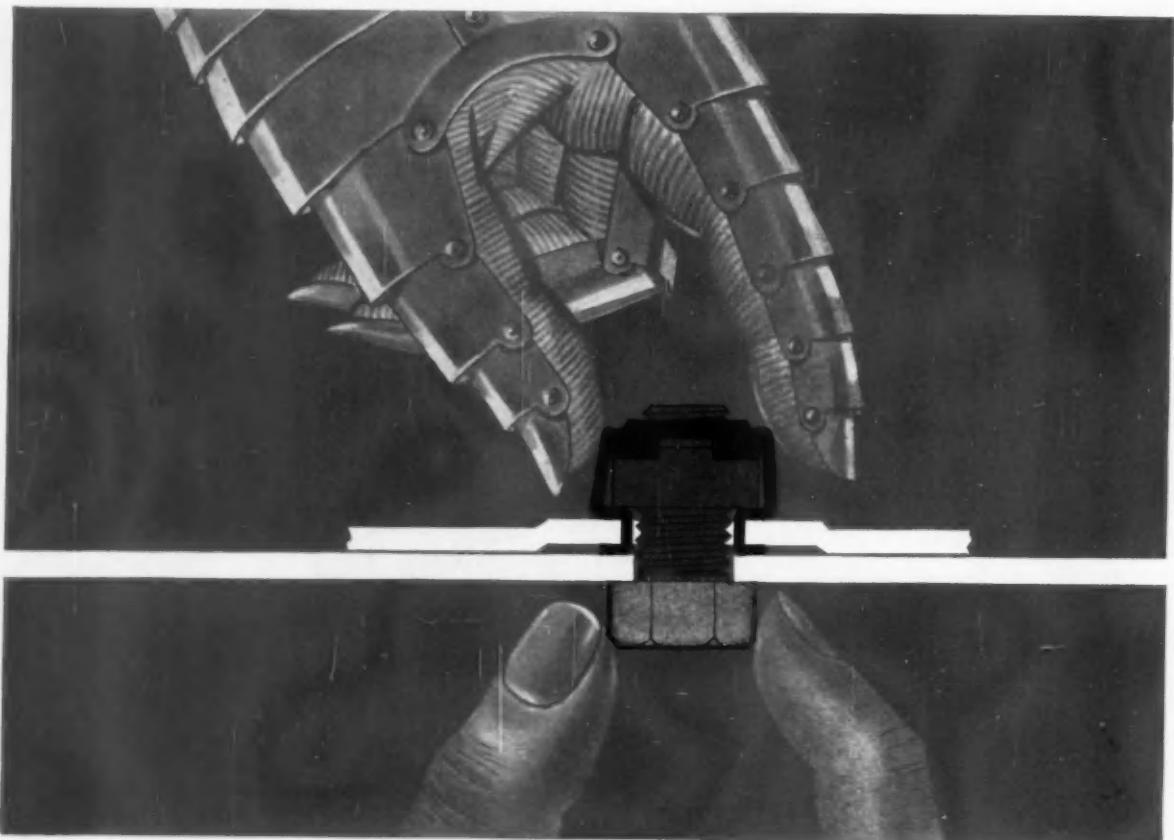
- Zinc phosphating in tank
- Zinc phosphating in spray washer
- Iron phosphating in tank
- Iron phosphating in spray washer

Your local Oakite Technical Service Representative will gladly discuss surface treatment of metals with you. Give you the complete story on the Oakite CrysCoat Process. Write Oakite Products, Inc., 28A Rector Street, New York 6, N. Y.



*CrysCoated Products
Look Better...Last Longer!*

Technical Service Representatives Located in Principal Cities of United States and Canada



FINGERS OF STEEL that hold where you can't reach

If you can't reach the back of a panel to hold a nut, let the spring steel fingers of a Tinnerman SPEED GRIP® Nut Retainer hold it for you. No welding or staking, no special skills or equipment required. It's the most efficient way to attach a square nut to a panel in blind location.

The SPEED GRIP combines a square nut retained in a spring steel cage. The SPEED GRIP snaps easily into the panel. Expensive rigid position methods are eliminated. Nut floats free in the cage to offset minor hole misalign-

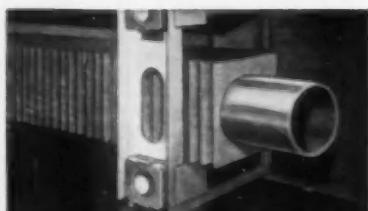
ments, but cannot turn as bolt is tightened.

SPEED GRIPS can be put on anywhere along your assembly line . . . no side trips to special stations, no line deviations of any kind. Rust-proofed, they can be applied after painting, ending costly masking or retapping of paint-clogged threads.

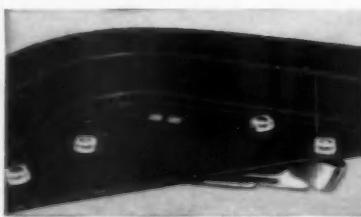
Consult your Tinnerman representative soon and write for Bulletin No. 335. **Tinnerman Products, Inc., Box 6688, Department 12, Cleveland 1, Ohio.**

TINNERMAN
Speed Nuts

FASTEST THING IN FASTENINGS®



SPEED GRIPS eliminate several punched and tapped holes, cut assembly costs 78%, simplify installation of heater.



SPEED GRIPS applied after painting simplify blind-location assembly of auto seat handle, avoid paint-clogging of threads.



SPEED GRIPS cut costs 75% by replacing tapped holes and weld-type nuts as mounting fasteners on car radio.

new **LORD** bonded rubber pivot joints never need lubrication

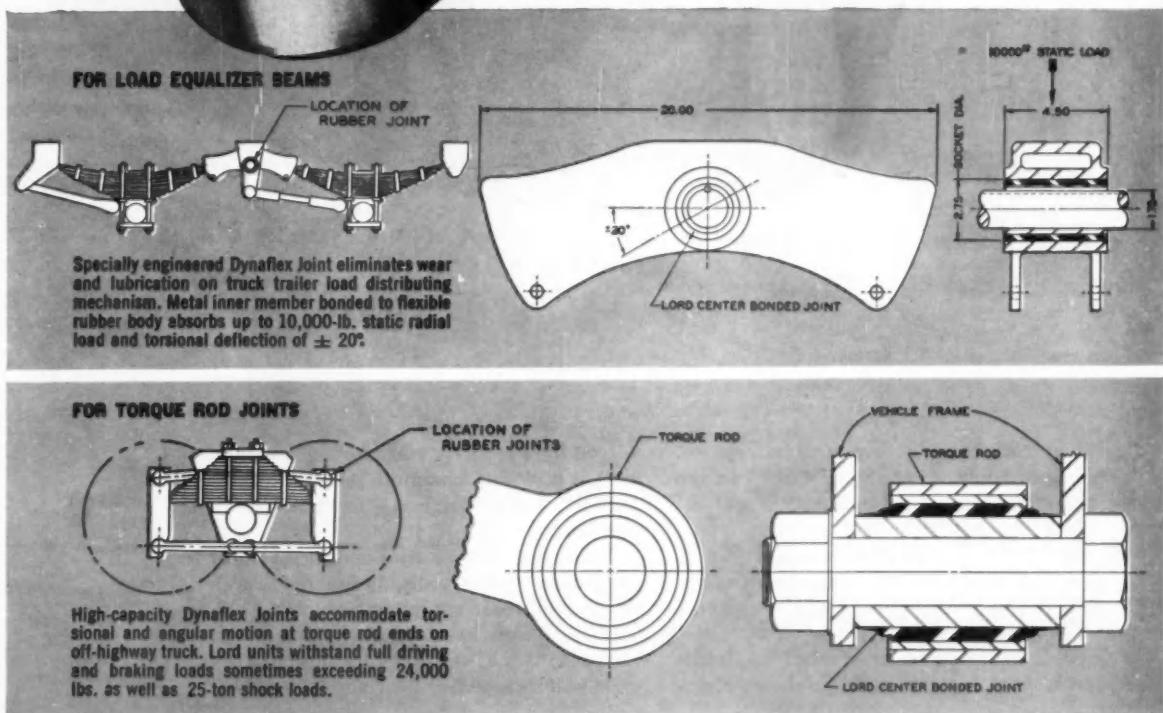


LORD DYNAFLEX® JOINT—a long-wearing, lubrication-free resilient bearing for pivots.

► With LORD Dynaflex® Joints you have a new, better answer to problems on pivot joints. One that eliminates wear and lubrication . . . absorbs shock and reduces noise . . . assures mounting and alignment accuracy.

These new, high-capacity resilient bearings provide positive cushioned action—and accommodate static and dynamic radial loads encountered in heavy duty commercial vehicles, torsional deflections up to $\pm 30^\circ$ and angular deflections up to $\pm 7^\circ$. Fatigue-defying flexing elements are specially compounded rubber, permanently LORD-bonded to steel members. Design is simple and compact, requires no close tolerances, and usually will fit present equipment with little or no change in mating parts. No metal rubs against metal.

Bonded rubber Dynaflex Joints are the product of LORD development engineers who can produce special designs to solve your specific pivot point application. For further information, contact your nearest LORD Field Engineer or write the Home Office, Erie, Pa., for Bulletin No. 703.



ATLANTA, GEORGIA - Cedar 7-1123
BOSTON, MASS. - Hancock 6-9135
CHICAGO, ILL. - Michigan 2-6010
CLEVELAND, OHIO - Shady-side 9-3175
DALLAS, TEXAS - Riverside 1-3392

DAYTON, OHIO - Michigan 8871
DETROIT, MICH. - Trinity 4-2060
LOS ANGELES, CAL. - Hollywood 4-7593
NEW YORK, N. Y. - Circle 7-3326
PHILADELPHIA, PA. - Locust 4-0147

"In Canada — Railway & Power Engineering Corporation Limited"

LORD MANUFACTURING COMPANY • ERIE, PENNSYLVANIA



designers
and producers
of bonded
rubber
products
since 1924



THIS SKF

Red Seal IS YOUR BEARING INSURANCE

When ball bearings are invaded by external dirt, life is cut short. If dirt can get in, so can other contaminants...and lubricant can leak out.

But when the **SKF** Red Seal is used...dirt and moisture are repelled and lubricant is positively retained until replaced.

DuPont Fairprene, the material of the Red Seal, remains unaffected by lubricants, heat, ageing and moisture. Rein-

forced by a securely staked steel retaining ring, it provides maximum sealing, lightest contact, lowest friction—for the life of the bearing.

Designed for use by manufacturers of motors, portable tools, household appliances and other equipment requiring efficiently sealed bearings. Available in all standard S.A.E. widths, fully interchangeable with non-sealed bearings.

7753

SKF

EVERY TYPE—EVERY USE

- Ball Bearings
- Cylindrical Roller Bearings
- Spherical Roller Bearings
- Tapered Roller Bearings ("Tyson")

*Reg. U.S. Pat. Off. Tyson Bearing Corporation

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

moisture-free air for air brake systems



HIGH CAPACITY—valve can eject up to 4 fluid ounces at a time... even expels foreign particles which may have settled to the bottom of the tank.

CORROSION RESISTANT metal parts. Diaphragms are a combination of neoprene and nylon cord for long life and high resistance to oil.

OPEN TO ATMOSPHERE—valve fluid cavities are open to atmosphere... it is impossible to trap moisture within the unit. *Cannot balance in open position... and "dump" reservoir pressure.*

Wagner moisture ejection valve keeps reservoirs clean and dry—automatically!

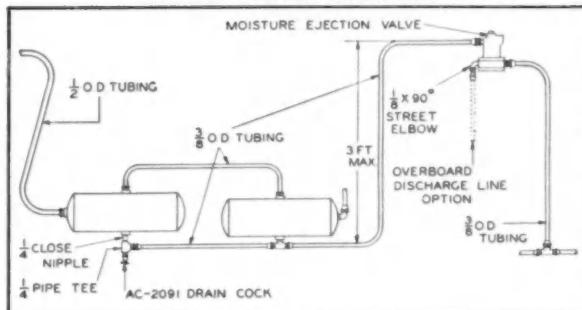
Since moisture accumulation in the brake system can be a problem, you'll be interested in this fully automatic moisture ejection valve.

Operating at 15 to 20 p.s.i. pressure, it ejects moisture with each average brake application.

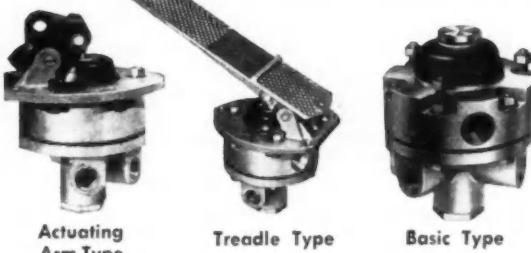
It mounts in any convenient location... no heating element is necessary as the valve cannot freeze in open (exhaust) position. It connects to the air system by two air lines—one leading from the bottom of the air reservoir and the other from a brake application line.

Expulsions occur without a noticeable drop in tank gauge pressure.

TYPICAL PIPING DIAGRAM



Wagner Air Brake Application Valves for Straight Air Systems



These valves provide complete braking control for safe, sure stops. Each valve is completely interchangeable with other makes of valves. The basic valve can be installed by simply transferring the actuating mechanism to the Wagner valve. The treadle valve can be adjusted to angle properly with the contour of the floor board and also offers external adjustment of exhaust valve clearance.

For complete information on Wagner Air Brake Systems, write today for Catalog KU-201A.

WAGNER ELECTRIC CORPORATION, 6363 PLYMOUTH AVE., ST. LOUIS 14, MO.

Wagner Air Brake Systems

WAGNER ROTARY AIR COMPRESSOR

Heart of the Wagner Air Brake System



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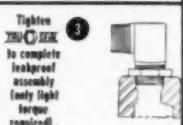
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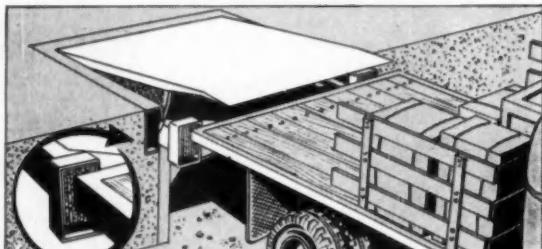
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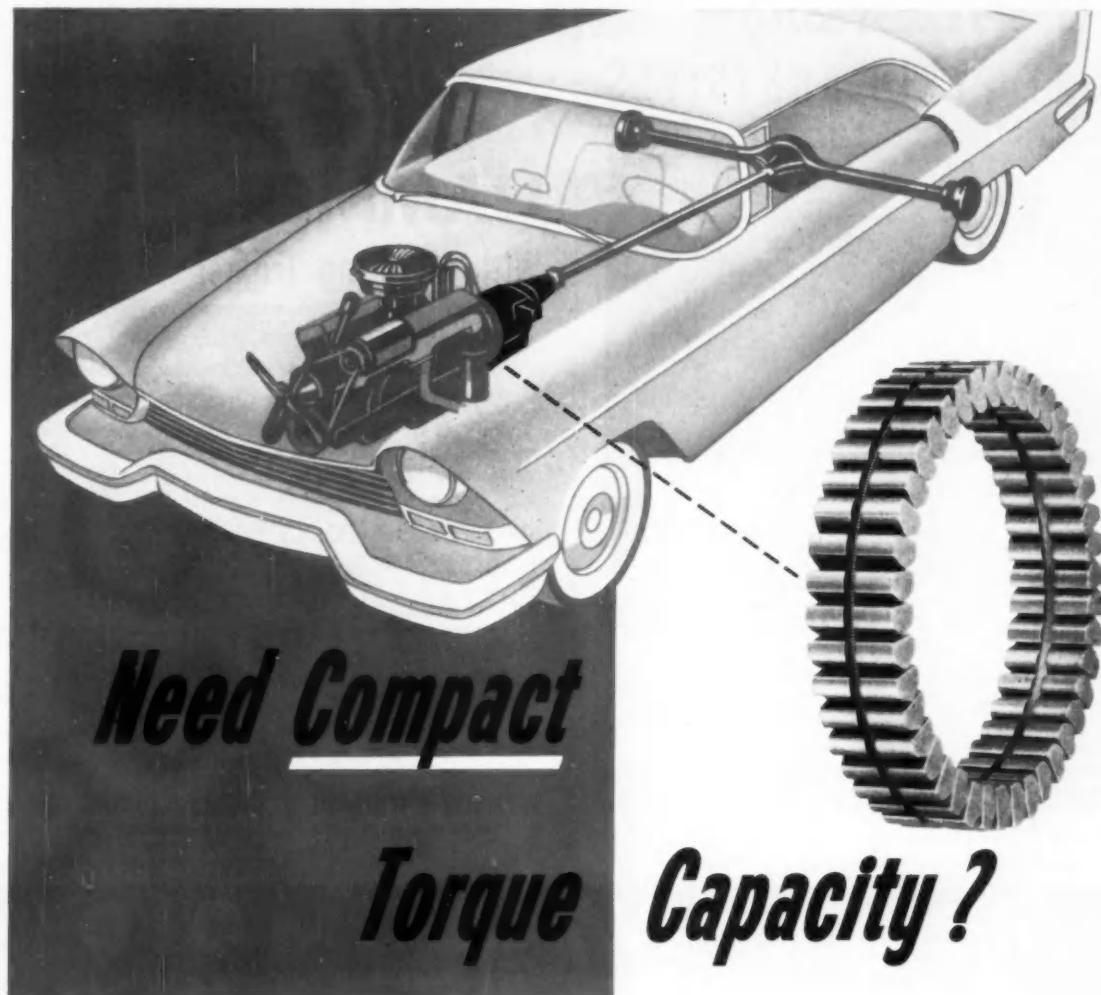
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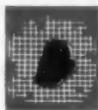
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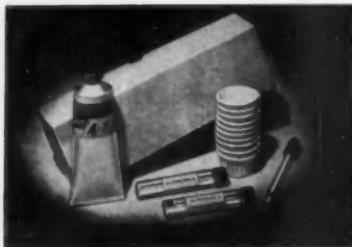
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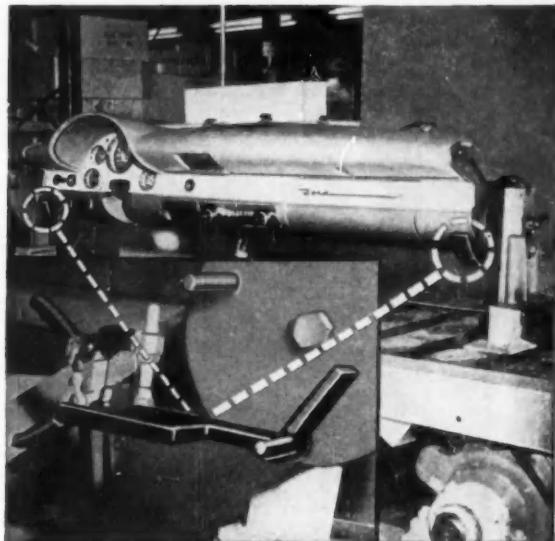
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The dark blue background
makes the scribed lines
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prevents metal glare. In-
creases efficiency and
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who sell to the World's Largest
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Now! Thor power tools that think for themselves!



AIR POWER tools with Thor Uni-Tork have external torque adjustments from 10 to 100 inch-pounds. Thor No. 2 screwdrivers and nutsetters (illustrated) are equipped with Silentair mufflers which reduce exhaust noise by 75%. Uni-Tork tools remove operator judgement from fastener work.



ELECTRIC POWER screwdrivers and nutsetters with Thor Uni-Tork mean longer service life, less wear and tear on the unit—infrequent torque adjustments, and quiet operation. Thor electric Uni-Tork tools can be purchased from industrial distributors. Ask for a demonstration.

THOR UNI-TORK

Now available in air and electric screwdrivers and nutsetters

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Thor Uni-Tork tools mean increased

production on the assembly line. When the desired preset torque is reached, Uni-Tork tools snap out of adjustment—no slipping or buzzing of clutch jaws. You get ease of operation and automatic torque control. Just set and forget. Use Thor Uni-Tork, the tools that think for themselves. Thor Power Tool Co., Prudential Plaza, Chicago 1, Illinois.



THOR POWER TOOL COMPANY, CHICAGO

Branches in all principal cities

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check with Milford Engineers!

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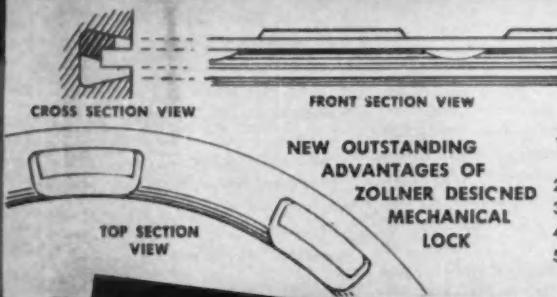


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WITH "NI-RESIST" IRON TOP RING SECTION



NEW OUTSTANDING
ADVANTAGES OF
ZOLLNER DESIGNED
MECHANICAL
LOCK



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4. Increases surface areas carrying inertia load.
5. Provides visual inspection of bond as seen in ring groove.

Double Bonded

METALLURGICALLY
Al-Fin Bond

MECHANICALLY
Zollner Lock

STOPS!
RING GROOVE WEAR
IN HEAVY DUTY SERVICE

"Sensational mileage" is the unanimous report of heavy duty engine builders and transport operators using Zollner "Bond-O-Loc" Pistons. Another great development by Zollner engineers, this super-mileage piston has a "Ni-resist" top ring groove section permanently incorporated with the *double bond* of both Al-Fin metallurgical and the exclusive Zollner mechanical lock. Separation failure is impossible. Ring groove wear problems are eliminated, blow-by prevented, oil consumption minimized, mileage to overhauls greatly increased. We suggest an immediate test of these sensational advantages for your engine.



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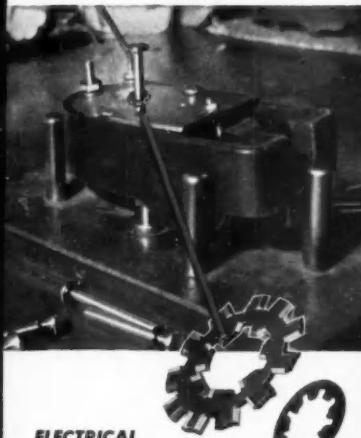
ZOLLNER • Fort Wayne, Indiana

Everlock lock fasteners



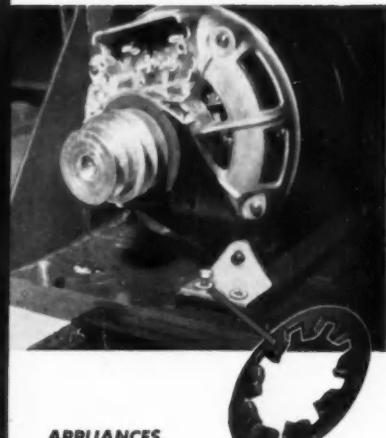
AUTOMOBILES TIGHT!

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ELECTRICAL EQUIPMENT TIGHT!

Everlock external and internal lock washers enable this temperature control to laugh at vibration. Any product that must be tight to be right needs Everlock.



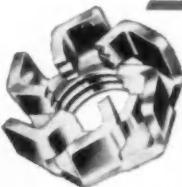
APPLIANCES TIGHT!

This motor will never loosen thanks to Everlock internal lock washer's 2-way bite. Vibration actually makes these amazing fasteners grip tighter.

2-way bite locks assemblies



Everlock Sems



Everlock Lock Nuts



Everlock Lock Washers



Everlock Terminals

tight

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